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ENVIROSOIL LIMITED

Environmental Assessment Registration Document - Addendum

Waste Oil Recycling and Water Treatment Facility, Dartmouth, Nova Scotia

December 14, 2021 – 19-1742

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December 14, 2021

Nova Scotia Environment and
Climate Change
1903 Barrington Street, Suite 2085
Halifax, Nova Scotia
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Attention: Candace Quinn
Environmental Assessment Officer

Waste Oil Recycling and Water Treatment Facility
Environmental Assessment Registration Document - Addendum

We respectfully submit the following Environmental Assessment Registration Document Addendum, in accordance to requirements for the Nova Scotia Environmental Assessment Regulations for a Class 1 project, regarding the proposed Waste Oil Recycling and Water Treatment Facility for Envirosoil Limited, located at 750 Pleasant Street, Dartmouth, Nova Scotia.

The EA Addendum Document respond's directly to the items identified in the Minister of Environment and Climate Change's request for additional information (letter dated May 28, 2021) and describes any amendments to the project description and identifies proposed approaches for installation of facility components and operational activities. It presents a balanced approach to achieving a defensible environmental assessment while considering environmental sustainability, community values, legislative requirements, business operations, and economic impact.

We look forward to your timely review of the documentation. Please contact the undersigned if you have any questions or require additional information.

Sincerely,

DILLON CONSULTING LIMITED

Paul Koke, M.A.
Project Manager

PEK:jes
Enclosure(s): Three (3) copies of EA Registration Document - Addendum

Our file: 19-1742-1000

Table of Contents

Figures

Tables

Appendices

Project Update & Overview

This Addendum document provides additional information to the Environmental Assessment (EA) Registration for the Waste Oil Recycling and Water Treatment Facility Project registered with the Nova Scotia Environmental Assessment Branch of Nova Scotia Environment and Climate Change (NSECC) on April 8, 2021. The project consists of the construction and operation of a facility that will be used for receiving, processing and recycling of waste oil and the treatment of wastewater located at 750 Pleasant Street in Dartmouth, NS. Several notable amendments to the proposed project approach, as well as important project highlights are briefly discussed in this initial Project Update & Overview.

In the April 2021 EA Registration, it was proposed that liquid wastes would be treated to meet the required regulatory criteria and discharged to Halifax Water's local sanitary sewer via a new 4" discharge line. This addendum upgrades this original proposal to discharge direct to Halifax Harbour. This decision was arrived at after extensive discussions with Halifax Water that identified that this discharge would be identified as "extraneous flow". It was agreed that this addendum would revise its approach to the discharge of treated wastewater. The current proposal is to discharge to the Halifax Harbour through a new 150-200 mm (6-8") discharge line, to be located adjacent the existing and currently operating site stormwater discharge system, which also employs a 6" discharge line.

It is important to note that Halifax Water, like most water utilities, actively reviews and tries to reduce extraneous flows into its sewerage system in an effort to manage and forecast loading on their collection and treatment infrastructure, while at the same time ensuring reliable service to its customers and protection of the environment. Inflow and infiltration reduction is used as one of several tools in Halifax Water's overall system Wastewater Management Plan, guided in part by their Regional Infrastructure Plan. Following discussions with Halifax Water, it was identified that an onsite marine discharge is a preferred option. Although the average discharge rate from the proposed Pleasant Street facility is anticipated to be only 15-30 gallons per minute (less than 0.04% of the nearby Eastern Passage Wastewater Treatment Plant's capacity), discharging treated effluent to the sanitary sewer would still increase the hydraulic loading on the municipal wastewater system. Further, as the wastewater would have already been treated at Pleasant Street, the municipal treatment plant is not expected to provide meaningful levels of additional refinement. In the case of either discharge scenario, the ultimate fate of the treated water is the same as they are within a very similar Halifax Harbour receiving environment.

The majority of wastewaters that will be treated at the proposed facility are anticipated to be associated with the marine industry, particularly bilge and other oily liquid wastes. Naturally occurring chlorides from marine or salt water are generally present in these types of liquid wastes; these are not organic chlorides typically associated with chemicals or contaminants. Removing chlorides from wastewater requires considerable amounts of energy to separate the ions, which generates unnecessary greenhouse gases, while the release of the chlorides is back to the originating source (i.e., the ocean environment).

Through the proposed treatment process, regulatory discharge limits will be met and the treated effluent will require discharge to a suitable receiving environment. Discharge of treated bilge waters and other oily liquid wastes to the marine environment is a common practice, including in Nova Scotia. It is important to consider that elevated levels of natural chlorides (from seawater) present in wastewater can have detrimental impacts to biological treatment systems and metallic piping, typically used in municipal treatment plants. In comparison, this is not a concern in the preferred direct discharge option to the Halifax Harbour from the proposed facility.

The proposed discharge point from the wastewater treatment facility is located at the upper extent of the heavily protected (by armour stone) harbour shoreline of the property. Consistent with the discharge from the stormwater treatment system, discharge will occur several metres above the ordinary high water mark and the discharge line will be accessible at all times. Under this typical discharge scenario, the facility will be required to meet federal Canadian Council of Ministers of the Environment (CCME) discharge limits, requiring treatment of wastewater to a higher standard than typical municipal sewer bylaw requirements. The discharge location allows for ease of accessibility for required routine visual inspections and maintenance, compliance monitoring, and importantly, does not require construction and installation of discharge infrastructure (e.g., underwater pipe and new outfall) below the high water mark. Where no physical works are required in aquatic habitat, there is no risk of a harmful alteration, disturbance or destruction of the natural environment. With the ability to monitor and control all liquid discharges from the treatment system, and confirm that CCME Marine Aquatic Life guidelines are met in all discharge from the facility, the risk to existing marine life due to the project is significantly reduced. This is consistent with the originally proposed option and potential effects of discharging to Halifax Water's local sewerage system and ultimately through the Eastern Passage WWTP.

The proposed project is strategically located adjacent to marine shipping routes and other commercial/industrial activities, and to Nova Scotia's most populated and fastest growing region. This facility is proposing to accept up to a maximum of 8,000 m^3 of waste oil and 10,000 m^3 of wastewater per year for treatment. Wastewater and waste oil are common by-products from domestic, industrial and commercial markets. Marine shipping, in particular, has a requirement for effective treatment of wastewater and waste oil, as it is a common constituent of bilges and fuel transfer areas. The proposed location minimizes the environmental impacts (particularly, the carbon footprint reduction) and safety risks associated with secondary trucking of wastewater and waste oil over considerable distances through environmentally sensitive areas. Currently, the nearest two similar facilities are located in Goffs and Debert, NS, and wastewater is also routinely trucked to a facility in the Cape Breton Regional Municipality for treatment and discharge to the ocean. Halifax is a world class shipping hub and there is significant local demand for effective treatment of these liquid wastes, and this demand is best met by a local service provider rather than long-haul trucking to distant similar facilities.

Establishing this facility close to existing industrial facilities, a large and growing population, and a nationally significant marine s economic sector, combined with a well-established treatment technology proposed for the system, provides HRM with an important option for treating this common effluent.

1.0 Introduction

This document provides additional information to the Environmental Assessment (EA) Registration for the Waste Oil Recycling and Water Treatment Facility Project registered with the Nova Scotia Environmental Assessment Branch of Nova Scotia Environment and Climate Change (NSECC) on April 8, 2021. The project consists of the construction and operation of a facility that will be used for receiving, processing and recycling of waste oil and the treatment of waste water, and is located at a portion of 750 Pleasant Street in Dartmouth, Nova Scotia. A request for additional information regarding the proposed undertaking was provided to Envirosoil Limited (the Proponent) by the Minister of Environment and Climate Change on May 28, 2021, in order to evaluate potential environmental effects related to the undertaking (provided in Appendix A).

It is anticipated that construction and installation of the waste oil recycling and water treatment system infrastructure will commence pending EA approval and subsequent permitting and approvals. Construction of project components is estimated to be completed within two to three months, with the facility fully operational within three to four months of the construction start (assumed in Spring of 2022). The facility is anticipated to be in operation for at least 25 years.

The proposed undertaking is on a previously disturbed industrial site, where a portion of the property is currently being used as an operating liquid asphalt receiving, storage and transfer facility.

1.1 Proponent Information

Company Description:
Envirosoil Limited (Envirosoil) is based in the Halifax Regional Municipality, Nova Scotia. Envirosoil is a private Canadian company. It is incorporated under the laws of Nova Scotia and registered to do business in Nova Scotia under the Nova Scotia Corporations Registration Act.

Envirosoil Limited Address:
927 Rocky Lake Drive
Bedford, Nova Scotia
B3A 4Z2

Authority:
Ken MacLean
Vice President
Tel: 902.222.7839

Harold Johnson
Vice President
Tel: 902.222.7839

1.2 Principal Contact for Purpose of Environmental Assessment

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1.3 Concordance - Minister's Request for Additional Information

Table 1 provides the sections of this document where each item from the Request for Additional Information can be found.

Table 1: Concordance

	Information Requested (Per Minster of Environment and Climate Change Letter, dated May 28, 2021)	Addendum Section
1) Facility Operation		
a)	Waste Oil/Wastewater Acceptance	
i	Additional information is required on the quality assurance and quality control programs (sampling and analysis) that will be undertaken in advance of material acceptance to ensure it can be treated at the facility	2.1
ii	Provide additional information on the sampling and analysis to be conducted for receiving contaminated water or used oil; including the methods and criteria be applied.	2.1
iii	Provide details on how off-spec materials will be managed if inadvertently accepted at the facility.	2.1
b	Waste Oil/Wastewater Sources: The Proponent shall clearly describe:	
i	All potential sources of wastewater and waste oil.	2.2

		Information Requested (Per Minster of Environment and Climate Change Letter, dated May 28, 2021)	Addendum Section
	ii	All contaminants of concern from each waste stream. This includes saline contamination as it is typically associated with marine bilge water.	2.2, 2.5
	iii	How each waste stream will be managed at the site to ensure appropriate treatment is applied.	2.2
c		Waste Oil/Wastewater Treatment: The Proponent shall clearly describe the capabilities of the various wastewater treatment system units or trains and what technologies would be used in different treatment scenarios with consideration to all potential waste streams and their associated contaminants (including saline). This includes detailing the following:	
	i	Design capabilities of all potential treatment equipment and types of contaminants it is intended to remove.	2.3
	ii	Operating limits of all potential treatment equipment (i.e., maximum acceptable concentration for the parameter that it is designed to treat).	2.3
	iii	Identifying any make-up water requirements for the treatment process. If make-up water is required, provide the source and estimated volumes to be used.	2.3.2
	iv	Any treatment units that will be required to remove any chemical additives used during the waste oil recycling process (i.e., demulsifiers).	2.3.1
	v	Any equipment maintenance/cleaning processes that are required and associated waste management.	2.3.2
d		Waste Oil/Wastewater Discharge: Halifax Water and other reviewers have identified serious concerns about the potential wastewater discharge having an adverse effect on the wastewater treatment facility and thus receiving environment (Halifax Harbour). The Proponent is required to prepare a Wastewater Management Plan, in consultation with, and accepted by Halifax Water. This Wastewater Management Plan should include but is not limited to:	
	i	Discharge volumes, frequencies, sampling and analysis programs, and applicable criteria to be met prior to discharge (i.e., compare with Sewer Discharge Bylaw criteria, CCME marine water quality guidelines for the protection of aquatic life and the Nova Scotia Environment Contaminated Sites Regulations, Tier I EQS for surface water). This should take into consideration effluent quality, quantities, and the municipal treatment system technologies.	2.4
	ii	Describing how wastewater discharges will be managed during pressure testing and equipment maintenance/cleaning processes.	2.4

	Information Requested (Per Minster of Environment and Climate Change Letter, dated May 28, 2021)	Addendum Section
iii	Describing emergency protocols in the event of a system upset and release of untreated water to Halifax Water and the marine environment.	2.4, 2.5
2) Surface Water Management		
a.	Provide a Stormwater Water Management Plan prepared by a Qualified Professional which includes but is not limited to the following:	3.1
i	A description of all system features (including the soil berm and ditch that surrounds the Site), their design capacities, connections and discharge points. This information should also be depicted on an engineered drawing.	3.2
ii	A description of how all stormwater will be collected and managed prior to discharge. This includes sampling and analysis programs to be undertaken and the applicable criteria to be met prior to discharge.	3.3
iii	Further details on spill control and management at liquid transfer points and storage areas, such as loading and unloading racks, transfer piping and tankage. This includes any related emergency design features, operational requirements, sampling and analysis programs and applicable criteria to be met prior discharge.	3.4
iv	If the site's drainage system permits stormwater drainage to enter the marine environment, an assessment of potential impacts to aquatic habitat and any applicable mitigation measures are required.	3.6
3) Air Emissions		4.0
a.	Green House Gas Emissions – additional information is required on GHG emissions related to the boiler use in the treatment process (including the natural gas requirements).	4.1
b.	A complete description of all types and volumes of potential air emission contaminants associated with the wastewater sources. This includes detail on proposed controls for those contaminants.	4.2
4) Odour Control		5.0
a.	Additional technical details are required for the odour control equipment to reflect proper sizing and maintenance, particularly for the tank that may be heated to break emulsions. More information is also required on how the Proponent will monitor the efficacy of proposed control measures and what further actions will be taken if the mitigation measures are inadequate.	5.0

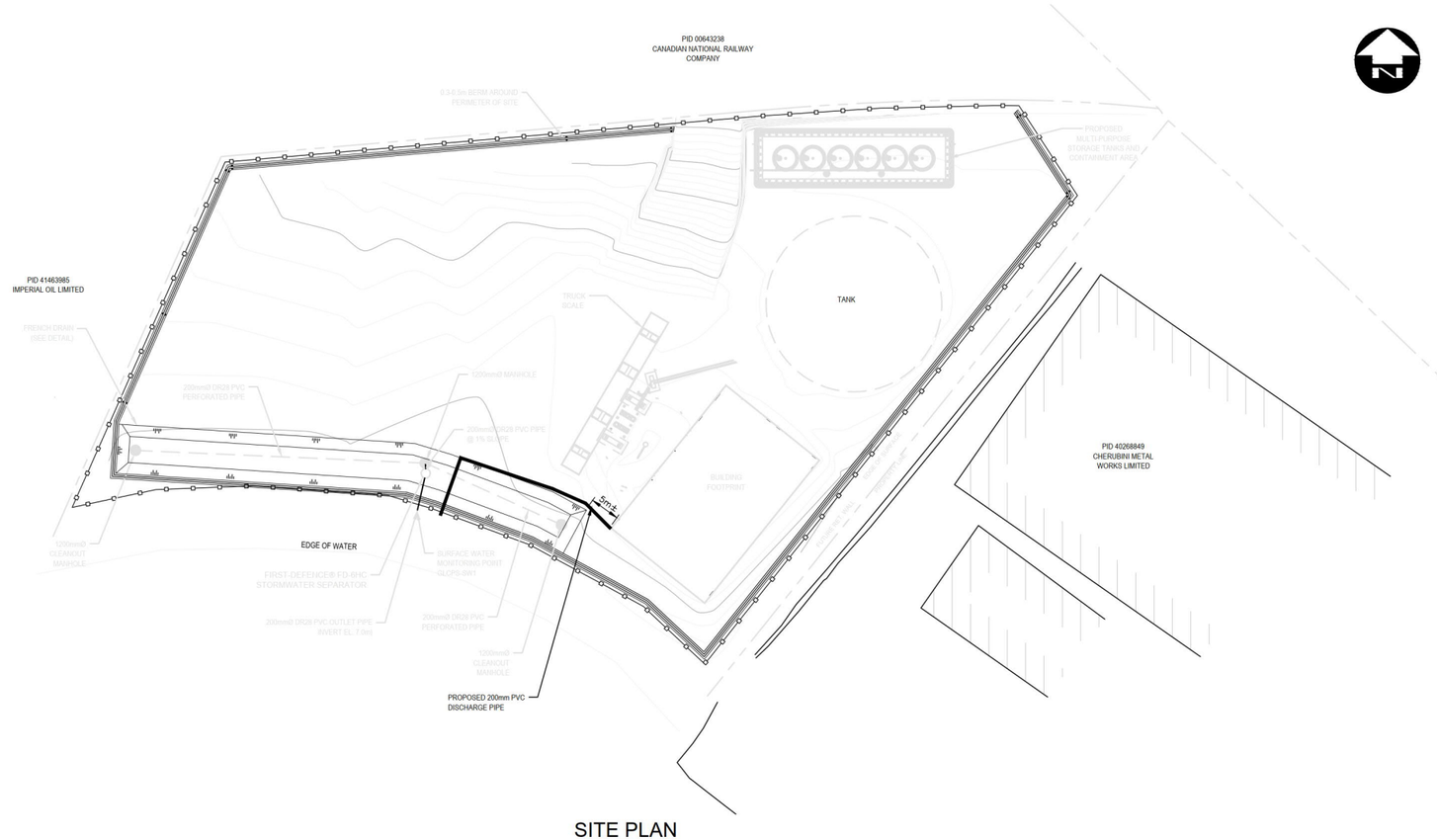
	Information Requested (Per Minster of Environment and Climate Change Letter, dated May 28, 2021)	Addendum Section
5) Marine Environment		6.0
a.	Provide an evaluation of potential impacts on the receiving marine environment for various wastewater treatment scenarios considering the capabilities of the proposed treatment technologies and limitation of the municipal treatment system.	6.1

1.4 Proposed Change to Initial Project Description

As described in the April 2021 Environmental Assessment Registration document for this undertaking, Envirosoil is proposing to install and operate a Waste Oil Recycling and Water Treatment Facility at an existing industrial site. In addition to receiving, treating and recycling waste oil, the proposed facility will be used for receipt and treatment of liquid waste waters. In the April 2021 EARD, it was proposed that liquid wastes would be treated to meet the required regulatory criteria and discharged to the local Halifax Regional Municipality sanitary sewer via a new 4" discharge line.

In consideration of the proposed facility's relative location to the Halifax Harbour, and at the request of Halifax Water following consultation and the development of a Wastewater Management Plan for the facility, reviewed by Halifax Water, Envirosoil has revised its approach to the discharge of treated wastewater and is proposing to discharge to the Halifax Harbour through a new 150 -200 mm (6-8") discharge line, to be located immediately adjacent the existing and currently operating site discharge system (First-Defense® stormwater separator), which also employs a 200 mm (8") discharge line (refer to Figure 1-1 and associated photo below). The new discharge line will connect from the southwest corner of the existing building that will house the treatment equipment to the discharge location near the top of the protected (by armour stone) shoreline of the Halifax Harbour. Consistent with the discharge from the stormwater separator, discharge will occur several metres above the ordinary high water mark and will be accessible at all times. Under this discharge scenario, the facility will be required to meet federal (CCME) discharge limits.

275 CHARLOTTE STREET, B1P 1C6



SITE PLAN
1:500

LEGEND

PROPOSED	EXISTING
	PROPERTY BOUNDARY
FENCING	
BERM	
PERIMETER DITCH	
SLOPE	
PERFORATED PIPE	
NON-PERFORATED PIPE	
MANHOLE	
STORMWATER SEPARATOR	

Conditions of Use

Verify elevations and/or dimensions on drawing prior to use. Report any discrepancies to Dillon Consulting Limited.

Do not scale dimensions from drawing.

REGISTERED PROFESSIONAL ENGINEER — PROVINCE OF NOVA SCOTIA — DATE: Nov/20 — 10253

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
2	RE-ISSUED FOR REVIEW	11/17/20	JAM
1	ISSUED FOR REVIEW	09/25/20	JAM
0	ISSUED FOR REVIEW	08/20/20	JAM

DESIGN: JAM	REVIEWED BY: KRM
DRAWN: HEB	CHECKED BY: JAM
DATE: JUNE 2021	
SCALE: AS NOTED	

WASTE OIL RECYCLING AND WATER TREATMENT FACILITY
PLEASANT STREET, DARTMOUTH, NS

PROPOSED NEW INFRASTRUCTURE AND CONTROLLED DISCHARGE LOCATION

PROJECT NO.: 19-1742

SHEET NO.: 1-1

Proposed treated discharge location, adjacent existing discharge point from on-site storm water separator (First Defence®) system (photo date: September 2021).

To confirm and provide clarity regarding the external infrastructure proposed as part of the project, surface water runoff collected from within the petroleum resistant secondary containment dyke that will support the six new multi-use storage tanks, located at the northeast corner of the site, will be directed to an oil/water separator prior to discharge into Halifax Water's municipal storm sewer, similar to other sites with industry-standard oil/water separator systems.

As a result of the proposed change in the location of the treated discharge from the Halifax Water sanitary sewer to the Halifax Harbour through a new 6'' discharge line, and in contrast to Project Valued Environmental Component (VEC) scoping previously completed and presented in the April 2021 EARD for this project, it is noted that there will now be an interaction with surface water resources (marine). Surface water (marine) is considered from the perspective of water quality. The potential effects to surface water resources, described in this Addendum, were determined and considered using knowledge of the existing infrastructure at the site, the specific proposed project activities, treatment system and controls, and Dillon's professional judgment. Mitigation measures to ensure the protection of surface water resources are described in considerable detail throughout this document, and

specifically within the project Wastewater Management Plan (Appendix B). Potential effects are also assessed in this project Addendum document. It is highlighted that no installation of infrastructure is being proposed below the ordinary high water mark (OHWM), and impacts to fish and fish habitat are not anticipated.

No additional changes to the Project Description presented in the original April 2021 EARD for the proposed facility are being considered or are proposed. Considerably greater detail regarding the wastewater management features and site surface water management features associated with this project are presented in this Addendum in response to the Minister's request for additional information, as well as the specific regulatory agency and public review comments that were received in response to the original EARD. A detailed and facility specific Air Emissions Assessment was also commissioned and is presented in Appendix D.

2.0 Facility Operation

The following sections provide the additional information requested regarding facility operations and the requested details regarding how waste oil and wastewater will be accepted, quality assurance for the sources of materials, treatment methods, and discharge parameters.

2.1 Waste Oil/Wastewater Acceptance

In this section we provide additional information on the quality assurance and quality control (QA/QC) programs - in the form of sampling and analysis - that will be undertaken in advance of material acceptance to ensure it can be treated at the facility. No material will be accepted before it passes the pre-acceptance QA/QC. We detail our measures to manage off-spec materials that may inadvertently be accepted at the facility. We also provide additional information on the sampling and analysis to be conducted for receiving contaminated water or used oil; including the methods and criteria be applied. This section is in response to Items 1) a., i, ii, and iii.

Wastewater and waste oil will enter the facility by truck via the existing Pleasant Street entrance to Envirosoil's facility. Truck arrivals on site will be by appointment only and analytical data will be provided to Envirosoil prior to receipt of wastewater.

In order to ensure that material accepted at the facility can be effectively treated, all materials entering the proposed treatment system will require a pre-delivery product analysis (e.g., laboratory confirmation) review from the shipper before they are received. In the event that materials are received that do not meet specifications appropriate for treatment and recycling through the facility's process (i.e., off-spec), those materials will be returned to the shipper within 72 hours of receipt. Please refer to Section 5.1 of the Wastewater Management Plan, located in Appendix B.

Delivery trucks will connect to the external loading connection on the treatment facility, and product will be pumped into unheated wastewater/waste oil storage tanks. During transfer, trucks will be parked on a containment pad that has an isolated sump, allowing for collection of any potential minor spills/drips. All loading will be metered and volumes will be recorded. All piping will be separate from the existing asphalt operations at the site, and therefore no potential exists for crossover during movement of liquids.

The treatment facility will be outfitted with a state of the art laboratory for testing both the incoming wastewater and the final treated effluent. The facility's in-house laboratory will utilize industry standard laboratory instruments, and in-house lab work will conform to the USEPA published documents and Ontario's *Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater* for its daily testing regime. Please refer to Section 5.1.2 of the Wastewater Management Plan for further detail.

The lab will utilize Hach equipment or equivalent, including a desktop spectrophotometer and ancillaries, Hach testing kits and testing tubes for specific tests, solids scales and furnace, and pH probes, all complying with Standard Methods requirements for equipment maintenance and calibration.

In addition, the plant will be equipped with a semi-continuous (10-30 minute intervals), Mantech Online PeCOD analyzer similar to the model used by Halifax Water for COD and BOD, as well as on-line TPH and solids analyzers for the final treated effluent. The online analyzers for treated water for discharge will yield an alarm and shut down the system based on pre-determined set point exceedances with TPH, TSS, COD or BOD. All laboratory waste by-products generated from testing will be disposed in accordance with local regulations and manufacturer's requirements.

2.2 Waste Oil/Wastewater Sources

This section provides a description of all known potential sources of wastewater and waste oil that may be accepted at the facility, and responds specifically to the Items 1) b., i, ii, and iii. It is noted, however, that the market for this type of disposal and treatment facility does not currently exist in the Halifax Regional Municipality, and therefore it is not necessarily possible to identify all potential sources of wastewater/waste oil at this time. Importantly, it is highlighted that the target market includes bilge waters, surface water oil spills, and used oil. Other sources may be accepted at the Owner's discretion, provided that the produced effluent meets regulatory requirements.

With respect to contaminants of concern from the waste streams (waste oil and waste water), similar to the challenges in identifying all potential sources of wastewater/waste oil, it is not possible to identify all contaminants of concern across all waste streams at this time. However, all incoming waste will be characterized prior to final discharge. Preliminary design parameters can be found in Table 3-3 of the Wastewater Management Plan included in Appendix B.

As outlined in the main EARD submission (April 2021) and further detailed in Section 2.3. below, approved liquid wastes will be treated at the facility through up to two systems: basic and advanced. The advanced process is an add-on/addition to the basic process and will be used for higher strength contaminants that cannot be treated to acceptable limits with the basic process alone. Onsite management of wastewater involves the product entering the facility through truck unloading, floor drains and catchbasins. It is then stored in the wastewater storage tanks and sampled prior to treatment, after which the appropriate treatment process is selected. Please refer to Section 3.4 of the attached Wastewater Management Plan for further detail.

With respect to bilge waters specifically, it is important to note that the source of chlorides is from marine or salt water. These chlorides are naturally occurring in the environment, and are not organic chlorides typically associated with chemicals or contaminants. Removing chlorides from wastewater requires considerable amounts of energy to separate the ions, which generates unnecessary greenhouse

gases; especially if the ultimate fate of the chlorides is back to the originating source (i.e., the ocean environment).

2.3 Waste Oil/Wastewater Treatment Technologies

This section details the design capabilities, operating parameters and processes of the treatment equipment and the contaminants each is intended to remove from its respective media. Refer to Appendix B for the full Wastewater Management Plan which includes additional tables, plans and a drawing package relating to the waste oil and wastewater treatment process. This section is in response to Items 1) c., i, ii, iii, iv, and v.

2.3.1 Waste Oil Treatment Process

The waste oil recycling system will be able to accept and treat all waste oils as defined by the Nova Scotia Used Oil Regulations. The system can treat, recover and recycle waste oil using a two-stage process:

1. Gravity Separation; and
2. Demulsification.

In the gravity separation treatment process, waste oil is placed in a dedicated storage tank and any free water is allowed to naturally decant via gravity separation. After the gravity separation process, the separated water is drawn off and sent to the wastewater treatment system. The remaining waste oil is then sampled and analyzed for basic sediment and water (BS&W). If the BS&W exceeds 3% then the waste oil contains too much emulsified water to be recycled as fuel. The oil is then sent to the secondary treatment process (demulsification) for further refinement. If the BS&W content is below 3% then the oil is deemed “good quality” and trucked off-site for use at an approved facility for beneficial reuse. In the demulsification treatment stage, the waste oil is heated via a closed loop heat exchanger from the on-site boilers and a demulsification chemical is added (if needed) in order to break the oil/water emulsion. Once the emulsion is broken, the free water separates via gravity as a separate phase and is removed and treated via the wastewater treatment process described in this section.

The demulsification process begins by transferring the waste oil into a ‘Treater Tank’, which consists of a vertical tank with a heating coil at the bottom. Once the Treater Tank is filled with waste oil, heating fluid (from the existing hot oil heaters) is allowed to pass through the coils and the waste oil is heated to 50 – 85℃ (depending on the type of hydrocarbon in the waste oil). Paratherm NF Heat Transfer Fluid will be used. It is a food grade, mineral-oil based heat transfer fluid designed for extended service in closed-loop liquid-phase systems. If needed, a chemical demulsifier is added to the waste oil to aid in the demulsification process. The demulsifier is biodegradable and safe for use and discharge to both sanitary and storm sewers, and ocean environments.

The application of heat and/or demulsifier effectively breaks the emulsion and allows the remaining water to separate from the oil. The separated water is drawn off and sent to the wastewater treatment system for treatment while the remaining waste oil is then sampled and analyzed for BS&W. If the BS&W exceeds 3% then the treatment process is repeated. If the BS&W is <3% then the waste oil is transferred to an appropriate tank and shipped off-site for beneficial reuse.

2.3.2 Wastewater Treatment Process

Envirosoil's proposed wastewater treatment facility will accept and treat a variety of non-sanitary commercial and industrial wastewaters. The system is comprised of two treatment trains: Basic Treatment and Advanced Treatment. The Advanced Treatment process is an add-on/addition to the Basic Treatment train and is used for the treatment of specific contaminants and/or to achieve lower discharge requirements. Similar to other existing Envirosoil operations, the waste generator will provide analysis to determine acceptance, and a random number of trucks will be selected for confirmatory sampling. Depending on the sampling results, the wastewater will be treated via the Basic Treatment process only, or the Basic and Advanced Treatment processes combined.

The plant is designed such that the treatment train can be started and stopped as needed. This will allow the plant flexibility in discharge. The plant is also capable of holding treated effluent for up to 48 hours, if required.

Envirosoil will mobilize all of the necessary equipment to allow for the effective installation and operation of the water treatment facility. The following components are expected to be required as part of the Basic Treatment train:

- Laboratory and Testing Equipment;
- Duplex Solids Filtration Unit;
- Dual Bag Solids Filtration Unit (Quantity: 2);
- Multi-bag Solids Filtration Unit (Quantity: 4);
- Fine Filtration Unit;
- Oil/Water Separator Unit;
- Activated Carbon Adsorption Unit;
- Organo-Clay Unit;
- Zeolite Adsorption Unit;
- Flow meter;
- Online TPH, and Solids Analyzers;
- BOD/COD Analyzer;
- Pumps, Piping & Instrumentation; and
- PLC control system and data logger.

All wastewater enters the facility from truck unloading, and via piped connection from the waste oil treatment system. Wastewater is stored in the wastewater storage tanks and sampled prior to treatment, the results of which will indicate the necessary treatment process (Basic or Advanced).

From the wastewater storage tanks, wastewater is pumped through a staged 6-unit bag filter consisting of decreasing pore sizes to remove solids. The bag filters are staged in series with pore sizes ranging from 50 microns to 1 micron and can be changed to optimize treatment depending on the wastewater characteristics. The solids separated from the process are sampled, tested, and trucked to an approved facility for treatment/disposal. The used bag filters are also sent to an approved facility for disposal.

The wastewater that passes through the multi staged bag filter is then passed through the oil water separator. Oil drains by gravity from the top of the separator and is stored in an oil day tank to be pumped back to the waste oil treatment system. Treated wastewater can then enter the advanced treatment system or bypass to the wastewater polishing system. The wastewater polishing system consists of an organoclay filter, two carbon filters, and zeolite filter for different contaminants removal, including metals. The spent carbon from the filters is disposed off-site at an approved location. After polishing, the wastewater is passed through a 1-micron disposal bag filter.

The wastewater is sampled and tested at the on-site lab, along with online measurements for TSS, TPH, TOC, COD and BOD prior to discharge. Two options are available for wastewater sampling:

1. Continuous discharge with in-house lab testing on a regular basis (i.e., one sample per shift) with 10% confirmatory to accredited lab; or
2. Batch process until in-house lab data is received. 5% of the confirmatory samples are sent to an accredited lab.

Wastewater that does not meet the discharge requirements will be diverted to the start of the process for additional advanced treatment process. All wastewater is metered and recorded prior to discharge. In the event that TSS, TPH, COD or BOD readings exceed programmed criteria, automatic sensors, valves, and pumps will divert the effluent back to the start of the treatment process.

The Advanced Treatment train augments the capabilities of the Basic Treatment train by adding one or more of the following process/treatment equipment elements (the actual components included will be based on the treatment requirements):

- Electrocoagulation Unit;
- Reverse Osmosis Unit;
- Membrane Filtration Unit (Micro/Ultra/Nano);
- Flocculator Unit; and
- Screw/Filter Press Unit.

If required, an additional process step (i.e., Advanced Treatment) consisting of a polymer electrocoagulation, reverse osmosis or ultrafiltration system can be implemented, which enhances the removal of metals and other contaminants. A screw press may be employed to dewater any sludge generated from these treatment processes and the filtrate water is then passed on to the Basic Treatment System. Components of this system will be selected based upon further assessment of wastewater streams and the system itself will meet applicable regulations and discharge permit conditions (e.g., CCME).

If the Advanced Treatment, such as electrocoagulation, reverse osmosis or ultra-filtration is used, the solid effluent from the screw press will be trucked to an approved facility for treatment and disposal. Although the system will be primarily designed to handle hydrocarbon-contaminated wastewaters, it will be capable of treating a variety of miscellaneous contaminants. The facility will be capable of treating wastewaters containing compounds such as:

- Hydrocarbons;
- Suspended solids;
- Metals (i.e., lead, copper, zinc, etc.);
- Ammonia;
- Nitrite/nitrates;
- Low levels of BOD; and
- Low levels of COD.

Any Liquid wastes generated during operation will either be passed through the treatment process again (if suitable for the technology), or removed from the site in either barrels or vacuum truck and delivered to an approved disposal facility. Please refer to Section 5.3 of the attached Wastewater Management Plan for additional details.

It is noted that operating limits of all treatment equipment is not available at this stage of the project planning phase. This information can be provided once design has advanced beyond the conceptual design phase (i.e., NSECC Industrial Approval application process), consistent with Section 5.2 of *A Proponent's Guide to Environmental Assessment* (Nova Scotia Environment, Revised 2017). Although unlikely to be required, any requirements for detailed make-up water requirements are not known at this early stage of design. Any make-up water requirements would be sourced by either recycled effluent or municipal water from Pleasant Street. It is noted that all equipment proposed for use in the facility meets industry standards and is conventional in its employment for use in similar applications around the developed world. None of the proposed treatment components are novel or unproven, and components have a longstanding track record with established parameters and standard operating procedures.

2.4 Waste Oil/Wastewater Discharge

This section provides an overview of responses to Items 1) d., i, ii, iii, included in the Minister's request for additional information. Full details associated with the discharge of final treated wastewater are presented in the Wastewater Management Plan (refer to Appendix B).

At the request of Halifax Water, and in consideration of the proposed facility's relative location to the ocean environment, final treated effluent from the proposed Pleasant Street facility is proposed to be directly discharged to the ocean environment, immediately adjacent the existing site discharge (storm water) location, rather than through the municipal sewer. The proposed discharge volumes are presented in Section 3.4.3 of the Wastewater Management Plan. Volume is estimated to be 16,000 m^3 per year, and the plant will run in batch or continuous operations depending on the delivery schedule for truck haulers. Approximately 40-50 m^3 are expected per day. For details regarding sampling and analysis programs, please refer to Section 5.0 of the Wastewater Management Plan (refer to Appendix B). For additional information regarding proposed effluent quality, please refer to Section 4.0 (Table 4-1) in the Wastewater Management Plan.

Clean water will be used for pressure testing and wet commissioning of facility components. During this phase, the used water will be collected and trucked offsite for disposal at a licensed facility. For more information, please refer to Sections 5.2 and 5.3 of the appended Wastewater Management Plan. During maintenance and cleaning activities, a pumper truck will be used to collect and dispose of the waste residuals offsite at a licensed facility.

While there are protocols in place to prevent accidental discharges, the Proponent has developed contingency plans to support additional scenarios. In the event of a system upset resulting in the release of untreated water to the marine environment, the operator will initiate emergency protocols. Depending on the nature of the release, including amount, location, time since discovery and contaminant levels, a floating fence boom and associated equipment stored at the site may be utilized. For more information on emergency protocols, please refer to Section 6.0 of the Wastewater Management Plan, as well as details outlined throughout the Emergency Response and Contingency Plan (Draft) that was provided as part of the April 2021 EARD submission for this project.

Refer to the Wastewater Management Plan in Appendix B for details regarding discharge parameters including volume, frequency, sampling and analysis methods and applicable criteria (Wastewater **Management Plan, Section 4.0**), describe management of discharges during maintenance and testing (**Wastewater Management Plan, Section 5.0**) as well as emergency protocols in the event of an accidental untreated release to the municipal wastewater system or Halifax Harbour (Wastewater **Management Plan, Section 6.0**).

2.5 Mitigation

Mitigation measures to prevent adverse environmental effects from wastewater and waste oil processing and the resulting effluent discharge include:

- Only accepting products that can be treated at the facility;
- Verifying the source of products prior to acceptance;
- Daily in-house laboratory testing of wastewater;
- Up to two levels of treatment as required depending upon the results of laboratory testing, and
- Treating effluent to meet or exceed applicable guidelines for discharge to Halifax Harbour.

2.5.1 Potential Residual Environmental Effects

Through the implementation of mitigation measures, environmental effects from waste oil and wastewater processing are not significant with a high level of confidence.

3.0 Surface Water Management

3.1 Surface Water Management Plan

In response to Item 2 in the Minister's letter requesting that additional information be provided regarding surface water management, a site Surface Water Management Plan was prepared, and is presented in Appendix C. This report section summarizes key aspects of the Surface Water Management Plan.

3.2 Surface Water Management System Features

The following is in response to Item 2) a. i. The area of the site is approximately 1.2 ha. Stormwater on the existing site is managed with site grading, perimeter berms, and a stone-filled infiltration trench system (French drain), collecting at a First-Defense® stormwater separator prior to being released to the Halifax Harbour. Site stormwater management system features are summarized in Table 2, with additional details on the orientation and sizing of the existing surface water management system, and the associated discharge point which are included in Appendix C.

Table 2: Stormwater Management System Features Summary

Feature	Design Capacity	Connection(s)	Discharge Point
Petroleum-Resistant Secondary Containment Dyke	110% volume of largest tank or 100% of largest tank +10% of aggregate capacity of all other tanks (whichever is greater)	OWS Piping	Oil Water Separator (OWS), then to Sewer Lift Station (Halifax Water)
Double-Walled FRP Oil Water Separator (OWS) – same as noted above	15,000 L	40 PVC OWS Drain Pipe	Sewer Lift Station (Halifax Water)
Earthen Perimeter Berm (existing)	Approx. 0.15m high	French Drain (existing)	French Drain (existing)
French Drain (existing)	166 m^3 of volumetric runoff storage	Perforated Piping (existing)	First-Defence® FD-6HC (existing)
First-Defence® FD-6HC stormwater separator (existing)	Peak Flow: 906 L/s Min. Sediment Storage: 1.2 m^3 Oil Storage Capacity: 1878 L	Outlet (existing)	Halifax Harbour

3.3 Stormwater Collection and Management

The following is in response to Item 2) a. ii. The footprint of the six (6) multi-use tanks and associated containment area is considered in the Surface Water Management Plan (as detailed in Appendix C). Installation of this new external infrastructure is not expected to alter existing drainage patterns on the property.

Design of the new tank system is such that water collected within its containment dyke will be directed to a 15,000L oil-water separator prior to release to the Halifax Water municipal storm sewer. The OWS is a standard commercial product design that is commonly used in the HRM to treat precipitation collected in containment structures, prior to discharge to the storm sewer system. As such, post-development runoff conditions are not expected to change compared to existing conditions.

Post-development site runoff is not expected to have an impact on the receiving body (Halifax Harbour) nor cause adverse stormwater effects to adjacent properties. Runoff is contained on-site by an existing earthen perimeter berm and ditching. Site grading and ditching directs runoff from all areas towards the French drain (consisting of a stone-filled infiltration trench and perforated pipe) to promote infiltration and intercept and remove suspended solids (TSS) from runoff. A First-Defense® FD-6HC stormwater separator is installed downstream of the perforated pipe to allow for separation of oils and hydrocarbons, coarse particles, fine particles, and trash and floatables prior to discharge, if required. The loading and unloading area is a concrete pad that is sloped to a closed catchment basin.

3.4 Surface Water Management and Monitoring

The following is in response to Item 2) a. iii. The stormwater collected at the project site is to be monitored for both quality and quantity. A surface water sampling plan focusing on metered readings for temperature, pH, turbidity and conductivity and water sampling for TSS will be undertaken on a monthly basis. The sampling plan is consistent with the current operational monitoring at the site, with the exception of the additional monitoring for TPH since waste oil and wastewaters will be received at the site. Additional monitoring during storm events can be undertaken, if necessary. The complete proposed monitoring plan is consistent with recommendations provided in the main EARD submission and is attached in Appendix C.

3.5 Erosion and Sedimentation Control Plan

An Erosion and Sediment Control Plan (ESCP) has been developed for the construction and operational phases at the project site to mitigate erosion as much as possible, and to incorporate sediment control where needed. Recommended adaptable ESC measures are outlined in the ESCP attached in Appendix C, and include ditches, silt fencing, and other control measures as deemed appropriate. Upon project completion, grading on site is not expected to change from existing conditions.

3.6 Additional Item: Stormwater Release to Marine Environment

Post-development site runoff is not expected to change from existing conditions, as a result of this proposed undertaking. Site grading and ditching directs runoff from all areas, including loading and unloading, towards the French drain (consisting of a stone-filled infiltration trench and perforated pipe) to promote infiltration and intercept and remove suspended solids (TSS) from runoff. A First-Defense® FD-6HC stormwater separator is installed downstream of the perforated pipe to allow for separation of oils and hydrocarbons, coarse particles, fine particles, and trash and floatables prior to discharge, if required. Post-development site runoff is not expected to have an impact on the receiving body (Halifax Harbour).

3.7 Reporting

The reporting required for this project, as outlined in Appendix C, will provide updates to plans and engineered drawings of containment features and environmental controls. This will inform the ongoing monitoring and maintenance of stormwater features and erosion and sedimentation control measures as the site is developed.

3.8 Mitigation

Mitigation to prevent adverse environmental effects from site runoff include:

- Secondary Containment Dyke;
- Double-Walled FRP Oil Water Separator;
- Existing Earthen Perimeter Berm;
- Existing French Drain;
- Existing First-Defence® FD-6HC stormwater separator;
- Stormwater sampling and monitoring; and
- An Erosion and sediment control plan.

3.8.1 Potential Residual Environmental Effects

Through the implementation of mitigation measures, monitoring and best management practices related to surface water management throughout construction and operation, environmental effects are not significant with a high level of confidence.

4.0 Air Emissions

4.1 Greenhouse Gas Emissions

Estimated greenhouse gas (GHG) emissions (along with other air contaminants) are provided in Table 2 with supporting calculations in Appendix D. GHG emissions during facility operation are expected from the natural gas-fired boilers used to heat oil in a closed loop system, and the oil water separator/ dissolved air floatation unit. During the construction phase, it is anticipated that GHG emissions will be below operational phase levels since facility construction will primarily involve the installation of pre-fabricated tanks and equipment into an existing building facility, and natural gas-fired boilers will not be operating during this phase of the project.

The estimated emission rate of total GHGs for the facility is 92,966.2 Kg/yr. Primary constituent GHGs include Carbon Dioxide, Methane and Nitrous Oxide.

4.2 Potential Air Emission Contaminants

Table 3 provides the estimated annual emission rates of contaminants associated with the waste oil and wastewater sources.

The contaminants are grouped as volatile organic compounds (VOCs), polycyclic aromatic compounds (PAHs), air pollutants, and GHGs. Refer to Appendix D for additional details and calculations.

Table 3: Estimated Annual Emission Rates of Contaminants

Contaminant Categories	Contaminant Name	CAS #	Total Facility Emission Rate (Kg/yr.)
VOCs	Total VOCs	-	160.5
	n-Alkanes	-	30.6
	Branched alkanes	-	59.1
	Saturated cycloalkanes	-	8.5
	Alkylbenzenes	-	7.2
	n-Alkanoic acids	-	2.0
	Aromatic acids	-	0.08
PAHs	PAHs	-	5.8
	Alkylated PAHs	-	81.2
Air Pollutants	Nitrogen Oxides	10102-44-0	52.5
	Carbon Monoxide	630-08-0	22.1
	Particulate Matter	TSP	2.9
	Sulphur Dioxide	7446-09-5	0.03

Contaminant Categories	Contaminant Name	CAS #	Total Facility Emission Rate (Kg/yr.)
GHGs	Total GHGs (CO2e)	-	92,966.2
	Carbon dioxide	124-38-9	91,754.6
	Methane	74-82-8	29.4
	Nitrous oxide	10024-97-2	1.6

Notes:
(1) Total GHG represented as carbon dioxide equivalents (CO2e).

4.3 Mitigation

Mitigation to reduce GHGs during operation of the facility include the use of natural gas versus liquefied petroleum (L.P.) gas or fuel oil (#2 fuel oil). Typical natural gas emissions of CO_2 for the burner are 9%-10% while L.P. Gas and fuel oil are 10%-12% and 10%-13%, respectively. Nitrous Oxide (NOx) emissions using natural gas are also lower than the emissions for L.P. Gas and fuel oil - 0.088lb NOx per 106 BTU input vs 0.092 lb. NOx per 106 BTU and 0.12lb. NOx per 106 BTU, respectively.

4.3.1 Potential Residual Environmental Effects

By using a relatively cleaner fuel source as a mitigative measure to reduce GHG emissions, environmental effects are not significant with a high level of confidence.

4.4 Ancillary Project Benefits Associated with Air Emissions

It is important to highlight that this project is strategically located to marine shipping routes and other commercial/industrial activities, and to Nova Scotia's most populated region. In addition to improving overall road safety and reducing congestion, as well as environmental and safety risks associated with secondary trucking of wastewater and waste oil over considerable distances through environmentally sensitive areas (as the nearest two similar facilities are located in Goffs and Debert, NS), an important carbon footprint reduction will be realized by providing a more local service option and by reducing distances travelled by tanker trucks on Nova Scotia's roads.

5.0 Odour Control

Envirosoil proposes to install a TIGG corporation N1200-PDB granular activated carbon (GAC) filter to treat all air emissions streams from the storage tanks and heated tanks. From discussions with the manufacturer, it was assumed that the minimum VOC removal rate of the GAC (based on similar operations and GAC filter removal efficiencies) could be anticipated to be approximately 95%. It was conservatively assumed that there would be no removal of PAHs from the GAC. Manufacturer specifications for the TIGG GAC filter are provided in Appendix D.

The TIGG carbon air filter was selected based on successful implementation at the adjacent Liquid Asphalt Storage Facility operated at the subject property. The manufacturer recommends a superficial velocity of 10 to 100 cfm/square foot (ft2) of area. For odour control, the recommendation is reduced to less than 60 cfm/ft2. The N1200-PDB GAC filter can meet this recommended threshold.

Specifications and an operating and maintenance manual for the filter is provided in Appendix D.

5.1 Mitigation

Key mitigation to prevent any unwanted odours escaping the facility includes:

- The installation of proven air filter technology and operating within the manufacture's specifications.

5.1.1 Potential Residual Environmental Effects

Through the implementation of mitigation measures, monitoring and best management practices related to odour management, environmental effects are not significant with a high level of confidence.

6.0 Marine Environment

As described throughout this Addendum document, and detailed in the Wastewater Management Plan (Appendix B) and Surface Water Management Plan (Appendix C), monitoring and process control, including in-line analysis of key parameters and automated controls, will ensure that discharges meet or exceed all relevant permit conditions and legislative requirements for treatment and product discharge, including CCME marine water quality guidelines for the protection of aquatic life.

In the event of an accident, malfunction or unplanned event that could adversely impact the marine environment, Envirosoil will have a robust set of emergency response and contingency plans, as required under a provincial Industrial Approval, and as presented (Draft) in the EARD and this Addendum document.

It is also noted that the selection of the new discharge location at the site, will not require construction and installation of discharge infrastructure (e.g., new outfall) below the high water mark. No physical works will be required in fish habitat, and therefore there is no risk of a harmful alteration, disturbance or destruction of fish habitat. By meeting CCME marine water quality guidelines for the protection of aquatic life, in all discharge from the facility it is also unlikely that death to fish or any other marine life would occur as a result of project activities. This is consistent with the originally proposed option and potential effects of discharging to Halifax Water's local system and ultimately through the Eastern Passage WWTP.

6.1 Accidental Release of Hazardous Materials

An accidental release of fuel or other liquid hazardous materials (e.g., petroleum, oil, lubricants - POL) used in vehicles or equipment on-site may occur during refuelling of machinery or trucks as a result of human error or equipment malfunction during construction activities. During operation of the facility, there is potential for release of chemicals used in operations as well. Such a spill may contaminate soils and groundwater and, through runoff, contaminate surface water resources.

An accidental release of a hazardous material through a spill could affect primarily marine surface water resources (as well as groundwater, soils and air quality) on a temporary and localized basis. Untreated wastewater or fuel spills may enter a waterbody potentially affecting water quality and fish and their habitat, with the extent of effects depending upon the quantity released.

6.1.1 Mitigation

- Key mitigation to prevent an accidental release of a hazardous material is described in the provincial Environmental Assessment Registration Document - Section 5.8 – Standard Mitigation Measures (refer to: https://novascotia.ca/nse/ea/Waste-Oil-Recycling-and-Water-Treatment-Facility/).

6.1.2 Potential Residual Environmental Effects

With spill containment provided during operation and maintenance, and careful implementation of best practices, the risk of spills resulting during both construction and operation and maintenance phases of the project is expected to be low. The risk of contamination from spills and leaks during the operation and maintenance phase will be reduced further by preventive measures, contingency planning and spill response and mitigation. Based on the project's design, and with the implementation of mitigation measures, contingency and emergency response procedures, and best practices, the potential residual environmental effects of an accidental release of a hazardous material during all phases of the project are not significant, with a high level of confidence.

6.2 Accidental Release of Untreated Wastewater and/or Petroleum Hydrocarbons

An accidental release of waste oil, untreated wastewater and/or petroleum hydrocarbons could occur at the transfer locations or within the processing area, during the operation and maintenance phase of the project. An accidental release may be the result of equipment failure, human error, or material failure. A release of untreated wastewater or petroleum hydrocarbons from the transfer areas or process area could affect soil or water quality (surface water) if not contained. A release of untreated wastewater and/or waste petroleum hydrocarbons from the transfer locations or processing area could affect soil or water quality (groundwater or surface water). Based on the design of the wastewater treatment system itself, an accidental release of untreated wastewater and/or petroleum hydrocarbons to the discharge system could not occur due to system controls in place.

6.2.1 Mitigation

Key mitigation to prevent an accidental release of untreated wastewater and/or waste petroleum hydrocarbons includes:

- Transfer of waste water and waste oil will only occur on a containment pad;
- Trained operators will control the transfer of material form delivery trucks via pumps;
- Receiving tanks are all located inside a concrete containment area and will be equipped with high-level float that will sound an alarm and automatically terminate pumping if the high-level condition is reached to eliminate the potential for overfill;
- Operation of the facility will include regular inspection of all piping, hoses and tanks for leaks or potential points where a leak could occur, such as fractures and breaks;
- Storage tanks will be inspected, repaired and reconfigured in accordance with API 653 – Tank
- Inspection, Repair, Alteration and Reconstruction;
- External tanks have a dike capable of holding 100% of the largest tanks capacity + 10% of each additional tank;
- The project area is fully secured by fencing reducing the risk of intentional vandalism to the facility and its components;
- Over 300 m of 18" fence boom (as well as all the necessary support equipment) will be located at the site (consistent with the contingency measure for the existing asphalt storage facility at the same site)

and will be immediately available if required in the event of a spill. The pre-planned and expedient deployment of this boom would minimize the effects of any spills to the marine environment; and
- Routine influent and effluent testing for key parameters and indicator surrogates that will aid in quickly identifying a process failure.

Facility operations personnel will be given adequate training and orientation to allow them to perform their jobs safely and to respond to minor spills and leaks. Employees will be informed of potential hazards and safe operating procedures and will be familiar with the facility's Site Safety Plan and Safety Data Sheets (SDSs) for products used and stored at the site. The site is surrounded by an existing berm which is designed to contain releases from site operations.

6.2.2 Potential Residual Environmental Effects

Regular inspection of all components in industrial facilities is a standard component of a management system (e.g., SOPs) to prevent costly and potentially damaging leaks. Identifying potential issues early though an inspection plan allows for repairs or replacement of problem sections before a release occurs.

Through the implementation of an inspection plan, the potential residual environmental effects of an accidental release of wastewater and/or petroleum hydrocarbons to the environment during all phases of the project are not significant, with a high level of confidence.

6.3 Accidental Release of Excessive Quantities of Wastewater

An accidental release of excessive quantities of wastewater to be discharged could occur during the operation or during a rain or heavy precipitation event. The majority of the system will be housed in-doors and any exterior tanks will be located within a lined containment dyke. An accidental release may be the result of equipment failure or human error. A release of excessive wastewater from the wastewater treatment facility could affect the water quality at the discharge location and/or water quality (marine surface water) if not contained.

6.3.1 Mitigation

- Flow meters, pumps and control systems should be closely monitored and regularly inspected, repaired, and replaced, as required;
- Pump flow rates will be monitored to maintain an acceptable level of wastewater flow throughout the treatment system, and the system has a series of high level alarms and automatic shutdowns, as discussed above; and
- Trained operators will monitor outgoing wastewater quantities.

6.3.2 Potential Residual Environmental Effects

Through the implementation of mitigation measures as well as containment for all processes on site, accidental release of excessive quantities of wastewater to Halifax Water or the environment is not expected. Discharge from site is done on an as-required basis based on the incoming water quantities and does not allow for uncontrolled continuous flow, preventing unforeseen excess discharges. It is important to consider, and as a relative comparison, that the Eastern Passage WWTP is rated to discharge up to 25 ML/d, approximately 1500m away from the Pleasant Street site. In comparison, the proposed plant will discharge on average only 0.04 ML/d. It is also noted that the physical and biological characteristics of the marine environment are generally consistent between the Eastern Passage WWTP and the proposed discharge location.

6.3.3 Summary

No in-water work is proposed as part of this undertaking, and there are no situations where there is a high probability of occurrences of long or extended-term residual environmental effects on surface water quality (marine) of high magnitude, or high probability of occurrences of an irreversible residual environmental effect of high magnitude. With the implementation of the identified mitigation measures (in addition to those outlined in Appendix B and Appendix C of this Addendum), the residual environmental effects of the project on surface water during all phases of the project are rated not significant, with a high level of confidence.

7.0 Additional Items

7.1 Indigenous Engagement

The Proponent consulted with the Nova Scotia Office of L'nu Affairs to help identify the appropriate Indigenous groups to engage regarding the proposed undertaking (correspondence was included in Appendix I of the April 2021 EARD submission). In early December 2020, project notification letters were sent by email to the following Mi'kmaq communities and organizations:

- Millbrook First Nation;
- Sipeknakatik (Shubenacadie) First Nation; and
- Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO).

The project notification letters described the purpose and need for the undertaking and the proposed facility and operations, including the typical types of materials that will be handled at site. Follow up correspondence by phone and email to representatives of the above noted communities and organizations was carried out over the course of December 2020 and early January 2021. Notification was also provided by email regarding the Registration of this Addendum document.

To date, the above noted First Nations and KMKNO have not responded to the project notification letters, or demonstrated interest in the proposed undertaking. However, the Native Council of Nova Scotia (NCNS) did provide comments during the 30 day public review and comment period for the April 2021 EARD submission regarding the proposed undertaking. Comments provided by NCNS were primarily associated with odour and air emissions, surface water management and containment, and emergency response and contingency planning. The Proponent responded directly to NCNS's comments on May 28, 2021, indicating that additional component studies would be completed and more information would be compiled and presented in the required follow-up EAR Addendum submission as part of the Environmental Assessment process, and these assessments and the additional information provided would specifically address NCNS's expressed interests and concerns.

Envirosoil also noted that the nature of the concerns identified in NCNS's comments are particularly relevant to the Permit to Construct and Operate (Part V Approval) under the province's Industrial Approval (IA) process including, but not limited to, odour, emergency response, and spill management.

7.2 Emergency Response and Contingency Plan (ECRP)

As Envirosoil develops a final ECRP for the proposed project, the recommendations provided by Environment and Climate Change Canada (ECCC) following its review of the April 2021 EARD will be incorporated, where appropriate, based on operations and conditions including, but not limited to, the following:

- Reviewing additional standards and best practices;
- Updating or including dangerous/waste dangerous goods;
- Clarifying language, roles and responsibilities and reporting requirements, and
- A thorough review of potential emergency scenarios.

Appendix A

Request for Additional Information Letter

NOVA SCOTIA

Environment and Climate Change
Office of the Minister

PO Box 442, Halifax, Nova Scotia, Canada B3J 2P8 • Telephone 902-424-3736 • novascotia.ca

File number: 10700-40-57567
40100-30-312

May 28, 2021

Ken MacLean/Harold Johnson, Vice Presidents
Envirosoil Limited, Municipal Group of Companies
927 Rocky Lake Dr.
Bedford, Nova Scotia
B4A 3Z2

Dear Mr. MacLean and Mr. Johnson:

Re: Environmental Assessment – Envirosoil Limited – Waste Oil Recycling and Water Treatment Facility - Dartmouth, Nova Scotia.

The environmental assessment of the proposed Waste Oil Recycling and Water Treatment Facility has been completed.

This is to advise that, pursuant to section 13 (1)(a) of the Environmental Assessment Regulations, I have determined that the Registration Document provided is insufficient to allow a decision, and that I require additional information. Specifically, the review determined that the following additional information is required to evaluate the potential environmental effects that may be caused by the undertaking:

1) Facility Operation:

a. Waste Oil/Wastewater Acceptance:
   i. Additional information is required on the quality assurance and quality control programs (sampling and analysis) that will be undertaken in advance of material acceptance to ensure it can be treated at the facility.
   ii. Provide additional information on the sampling and analysis to be conducted for receiving contaminated water or used oil; including the methods and criteria be applied.
   iii. Provide details on how off-spec materials will be managed if inadvertently accepted at the facility.

b. Waste Oil/Wastewater Sources: The Proponent shall clearly describe:
   i. All potential sources of wastewater and waste oil.
   ii. All contaminants of concern from each waste stream. This includes saline contamination as it is typically associated with marine bilge water.
   iii. How each waste stream will be managed at the site to ensure appropriate treatment is applied.

c. Waste Oil/Wastewater Treatment: The Proponent shall clearly describe the capabilities of the various wastewater treatment system units or trains and what technologies would be used in different treatment scenarios with consideration to all potential waste streams and their associated contaminants (including saline). This includes detailing the following:
    i. Design capabilities of all potential treatment equipment and types of contaminants it is intended to remove.
    ii. Operating limits of all potential treatment equipment (i.e. maximum acceptable concentration for the parameter that it is designed to treat).
    iii. Identifying any make-up water requirements for the treatment process. If make-up water is required, provide the source and estimated volumes to be used.
    iv. Any treatment units that will be required to remove any chemical additives used during the waste oil recycling process (i.e. demulsifiers).
    v. Any equipment maintenance/cleaning processes that are required and associated waste management.

d. Waste Oil/Wastewater Discharge: Halifax Water and other reviewers have identified serious concerns about the potential wastewater discharge having an adverse effect on the wastewater treatment facility and thus receiving environment (Halifax Harbour). The Proponent is required to prepare a Wastewater Management Plan, in consultation with, and accepted by Halifax Water. This Wastewater Management Plan should include but is not limited to:
    i. Discharge volumes, frequencies, sampling and analysis programs, and applicable criteria to be met prior to discharge (ie. compare with Sewer Discharge Bylaw criteria, CCME marine water quality guidelines for the protection of aquatic life and the Nova Scotia Environment Contaminated Sites Regulations, Tier I EQS for surface water). This should take into consideration effluent quality, quantities, and the municipal treatment system technologies.
    ii. Describing how wastewater discharges will be managed during pressure testing and equipment maintenance/cleaning processes.
    iii. Describing emergency protocols in the event of a system upset and release of untreated water to Halifax Water and the marine environment.

2) Surface Water Management:

a. Provide a Stormwater Water Management Plan prepared by a Qualified Professional which includes but is not limited to the following:
    i. A description of all system features (including the soil berm and ditch that surrounds the Site), their design capacities, connections and discharge points. This information should also be depicted on an engineered drawing.
    ii. A description of how all stormwater will be collected and managed prior to discharge. This includes sampling and analysis programs to be undertaken and the applicable criteria to be met prior to discharge.
    iii. Further details on spill control and management at liquid transfer points and storage areas, such as loading and unloading racks, transfer piping and tankage. This includes any related emergency design features, operational requirements, sampling and analysis programs and applicable criteria to be met prior discharge.

If the site's drainage system permits stormwater drainage to enter the marine environment, an assessment of potential impacts to aquatic habitat and any applicable mitigation measures are required.

3) Air Emissions:

a. Green House Gas Emissions – additional information is required on GHG emissions related to the boiler use in the treatment process (including the natural gas requirements).
b. A complete description of all types and volumes of potential air emission contaminants associated with the wastewater sources. This includes detail on proposed controls for those contaminants.

4) Odour Control:

a. Additional technical details are required for the odour control equipment to reflect proper sizing and maintenance, particularly for the tank that may be heated to break emulsions. More information is also required on how the Proponent will monitor the efficacy of proposed control measures and what further actions will be taken if the mitigation measures are inadequate.

5) Marine Environment:

a. Provide an evaluation of potential impacts on the receiving marine environment for various wastewater treatment scenarios considering the capabilities of the proposed treatment technologies and limitation of the municipal treatment system.

This information must be submitted by the Proponent within one year, as an addendum to the original Registration Document. Upon submission of the information, I will have 50 days to make my decision.

The Proponent shall publish a notice in the same manner as the original notice under Section 10 of the Environmental Assessment Regulations announcing the release of the additional information to the public and stating that the written comments may be submitted about the additional information to the Department.

If you have any questions regarding the approval of this project, please contact Helen MacPhail, Supervisor, Environmental Assessment Branch, at (902) 483-2696 or via email at Helen.MacPhail@novascotia.ca.

Sincerely,

Keith Irving, MLA
Minister of Environment and Climate Change

Encl.

c: Helen MacPhail, Environment and Climate Change

Appendix B

Wastewater Management Plan

DILLON CONSULTING

ENVIROSOIL LIMITED

Waste Oil Recycling and Water Treatment Facility Wastewater Management Plan

750 Pleasant Street, Dartmouth, Nova Scotia

December 2021 – 19-1742

Table of Contents

Figures

Tables

Appendices

Acronyms, Abbreviations and Definitions

Some of the regularly used and important technical abbreviations in this report are summarized below for convenience:

Table 1-1: Acronyms and Abbreviations

Abbreviation	Term	Definition
BOD_5	5 Day Biochemical Oxygen Demand	The amount of dissolved oxygen required over a 5-day period by microorganisms to oxidize or decompose organic matter found in wastewater.
$cBOD_5$	Carbonaceous Biochemical Oxygen Demand	The amount of dissolved oxygen required over a 5-day period by carbonaceous sources only.
COD	Chemical Oxygen Demand	The amount of oxygen required to chemically oxidize organic matter in water.
FOG	Fats, Oils & Greases	Animal, vegetable any synthetic substances found in fatty substances.
Kg	Kilogram	Unit of weight, equivalent to 2.20 pounds
m^3	Cubic Metre	Unit of volume, equivalent to 1,000 litres
ft^2	Square Feet	Unit of area, equivalent to 0.093 square metres
TKN	Total Kjeldahl Nitrogen	The sum of ammonia-nitrogen and organically-bound nitrogen.
TSS	Total Suspended Solids	The amount of particulate matter that remains suspended in water, related to turbidity or the “cloudiness” of water.
WWTP/WWTF	Wastewater Treatment Plant/Facility	A facility that receives domestic and industrial wastewater and through biological, chemical and/or physical processes produces clean effluent.

Executive Summary

Dillon Consulting Limited (Dillon) has prepared this Management Plan related to the wastewater treatment plant in Dartmouth, Nova Scotia. The proposed plant is a waste oil recycling and water treatment facility that will treat liquid waste in accordance with the CCME Water Quality Guidelines and local storm sewer bylaw. Waste oils recovered/collected as part of the facility's recycling process will be sent to licensed and approved facilities for beneficial reuse.

The following document outlines the scope of the project, the proposed facility design, applicable by-law and regulations, management practices and any emergency measures associated with plant operation.

The proposed facility will treat wastewater and waste oil that are common, non-sanitary waste products from the domestic, industrial and commercial markets. Envirosoil Limited (Envirosoil) is proposing to install a modern, industry standard waste oil recycling and water treatment system within the existing primary building. The treatment unit will employ a multi-stage system that includes optional stages for enhanced treatment and processes that can be adjusted and optimized to effectively treat the anticipated forms of waste oil and wastewater that will be received. The system can treat, recover and recycle waste oil using a two-stage process of gravity separation and demulsification.

The wastewater system is comprised of two treatment trains: *Basic Treatment* and *Advanced Treatment*. The Advanced Treatment process is in addition to the Basic Treatment train and is used for the treatment of specific contaminants and/or to achieve lower discharge requirements. Similar to other existing Envirosoil operations, the waste generator will provide analysis to determine acceptance, and a random number of trucks will be selected for confirmatory sampling. Depending on the sampling results, the wastewater will be treated via the Basic Treatment process only, or the Basic and Advanced Treatment processes combined.

At the request of Halifax Water, treated effluent is proposed to be discharged to the Halifax Harbour via an existing and operating site discharge system, and the new facility will be required to meet Federal discharge limits. Surface runoff from an onsite tank farm will be collected and sent to an oil/water separator prior to discharge into the municipal storm sewer, similar to other sites with industry-standard oil/water separator systems.

The plant will be equipped with a state of the art testing laboratory facility, where incoming wastewater and outgoing discharges of treated water will be representatively tested. Each storage tank of wastewater at the facility will be tested so that the treatment process can be adjusted based on specific requirements. Final treated effluent discharge will also be tested using online TPH, BOD and TSS analyzers, and shift samples taken at the in house lab. The laboratory facility will operate in accordance with the *Standard Methods for Water and Wastewater Treatment.*

Plant staff will follow the operation and maintenance protocols, which include monitoring, process control and reporting. Additionally, preventative maintenance and inspections will be done to keep the effluent quality within the required limits. Prior to the plant start up, wet commissioning will be conducted prior to the introduction of wastewater to identify and repair any possible leaks. Waste management best practices pertaining to the handling of liquid waste, hazardous waste and solid waste will be carefully followed by operation's staff. Emergency response measures for accidents, malfunctions and unplanned events are addressed and cover the accidental release of hazardous materials, the accidental release of untreated wastewater, and the accidental release of excessive quantities of wastewater along with mitigation actions.

1.0 Introduction

Envirosoil is proposing to install and operate a waste oil recycling and water treatment facility ("the project" or "the facility") on a longstanding and currently active industrial site, located at 750 Pleasant Street in Dartmouth, Nova Scotia ("the site"). The project will be located entirely within a property currently owned and operated by General Liquids Canada. The facility will be used for receiving, treating and recycling waste oil and liquid wastewaters. Liquid wastes will be treated to meet the required regulatory criteria and discharged to the Halifax Harbour via a new 150mm (6") discharge line, to be located immediately adjacent the existing and currently operating site discharge system (First-Defense® stormwater separator), which also employs a 150 mm (6") discharge line. Waste oils recovered/collected as part of the facility's recycling process will be sent to licensed and approved facilities for beneficial reuse.

The design and operation of the facility will be based on proven technology and methods used by similar operations across Canada. As described in Section 3.0, the construction/installation phase of the project will generally consist of installation of the required facilities, including the wastewater treatment system, multi-purpose storage tanks and associated upgrades to the electrical and piping connections at the existing General Liquids Canada facility. Storage and transfer of products to be received at the facility is by appointment only and carried out through the use of tanks, pipes and pumps which does not allow for uncontrolled emission of gas, vapours, liquids, or objectionable odour.

2.0 Scope

This Wastewater Management Plan is intended to address any potential wastewater discharge from the proposed facility and outline the mitigation measures implemented in order to avoid any potential adverse effect on the receiving environment (Halifax Harbour). Dillon has worked closely with Envirosoil to prepare a Wastewater Management Plan outlining:

1. Discharge volumes, frequencies, sampling and analysis programs, and applicable criteria to be met prior to discharge, taking into consideration effluent quality, and quantities;
2. How wastewater discharges will be managed during pressure testing and equipment maintenance/cleaning processes; and
3. Emergency protocols in the event of a system upset and release of untreated water to the marine environment.

On May 6, 2021, Halifax Water had issued comments related to Envirosoil's Waste Oil Recycling and Water Treatment Facility EA Registration via email (refer to: https://novascotia.ca/nse/ea/Waste-Oil-Recycling-and-Water-Treatment-Facility). The following points summarize Halifax Water's comments, which are addressed in this Management Plan:

1. The discharge of excessive quantities of wastewater at certain times (especially during rain events) when the wastewater system is at capacity and any excess discharge contributes to CSO overflow volumes to Halifax Harbour;
2. The discharge of non-compliant wastewater. We understand that the discharge will be treated and will be compliant with Halifax Water's regulations. However, in the event that a component of the treatment system fails or is unable to treat effectively or there is a contaminant in the wastewater that is unknown, there is a risk that this non-compliant discharge will impair or pass through Halifax Water's treatment system and enter the environment;
3. Through unintentional discharge to a stormwater system. This could occur in the event of a spill within the facility, from a truck transporting liquids to the facility or from an improper plumbing connection to the stormwater system;
4. The discharge of extraneous water; and
5. It is Halifax Water's understanding that bilge water may contain chloride concentrations far in excess of the limit allowed in the Halifax Water Regulations and that chlorides are difficult to remove through treatment. How does the proponent propose to ensure that chlorides in discharge do not exceed allowable limits?

Through correspondence with Halifax Water between May and October 2021, and following submission of a draft wastewater management plan to Halifax Water, Halifax Water requested that Envirosoil adjust its proposed operational plan and discharge treated effluent directly to the harbour, rather than to the sanitary sewer. That request is reflected in this Wastewater Management Plan, and was due to their operational constraints, rather than any perceived issue with Envirosoil's process.

3.0 Proposed Facility

This facility is proposing to accept an average of 16,000 m^3 per year of incoming waste oil and wastewater, with a maximum of 20,000 m^3 per year of treatment capacity. Wastewater and waste oil are common waste products from the domestic, industrial and commercial markets. Marine shipping in particular drives a requirement for effective treatment of wastewater and waste oil, as it is a common effluent from bilges and fuel transfer. Given Halifax's status as a world class-shipping hub, there is significant demand for effective treatment of this effluent and this demand is best met by a local service provider.

The proposed location for this undertaking is close to marine shipping and other industrial activities, which would minimize the environmental and safety risks associated with secondary trucking of wastewater and waste oil over considerable distances through environmentally sensitive areas (as the nearest two similar facilities are located in Goffs and Debert, NS). Currently, for example, most bilge water is trucked to Cape Breton for disposal, incurring large transporting costs and significant GHG emissions.

Envirosoil is proposing to install a modern, industry standard waste oil recycling and water treatment system within the existing primary building at the site. The treatment unit will employ a multi-stage system that includes optional stages and processes that can be adjusted and optimized to effectively treat the anticipated forms of waste oil and wastewater that will be received.

3.1 Facility Overview

Wastewater and waste oil will enter the facility by truck via the existing Pleasant Street entrance to Envirosoil's facility. Truck arrivals on site will be by appointment only and analytical data will be provided to Envirosoil prior to receipt of wastewater. These trucks will connect to the external loading connection on the treatment facility, and product will be pumped into unheated wastewater/waste oil storage tanks. This loading will be metered and volumes will be recorded. It is noted that all piping will be separate from the existing asphalt operations at the site, and therefore no potential exists for crossover during movement of liquids.

The existing building operated by General Liquids Canada has a set of boilers that use a food grade (non-toxic) oil to transfer heat to the asphalt concrete tanks to enhance its ability to transport. These boilers have sufficient and excess capacity to provide a heat source for the proposed waste oil treatment system. The following sections outline the specific processes proposed to treat wastewater and waste oil at the facility.

3.2 Laboratory Testing

The treatment facility will be outfitted with a state of the art laboratory for testing both the incoming wastewater and the final treated effluent. The laboratory will follow Ontario's *Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater* (v2.0) for its daily testing routine.

The lab will utilize Hach equipment (or equivalent), including a desktop Spectrophotometer and ancillaries, Hach testing kits and testing tubes for specific tests, solids scales and furnace, and pH probes, all complying with Standard Methods requirements for equipment maintenance and calibration.

In addition, the plant will be equipped with a semi-continuous (10-30 minute intervals), Mantech Online PeCOD analyzer similar to the one Halifax Water uses for COD, BOD, and TOCs, as well as on-line TPH and solids analyzers for the final treated effluent. All laboratory waste by-products generated from testing will be disposed in accordance with local regulations and manufacturer's requirements.

3.3 Waste Oil Treatment Process

The overall process flow for the treatment process is displayed within Figure 3-1 for reference; the complete drawing package is provided in Appendix A. The waste oil recycling system will be able to accept and treat all waste oils as defined by the Nova Scotia Used Oil Regulations. The system can treat, recover and recycle waste oil using a two-stage process:

1. Gravity Separation; and
2. Demulsification.

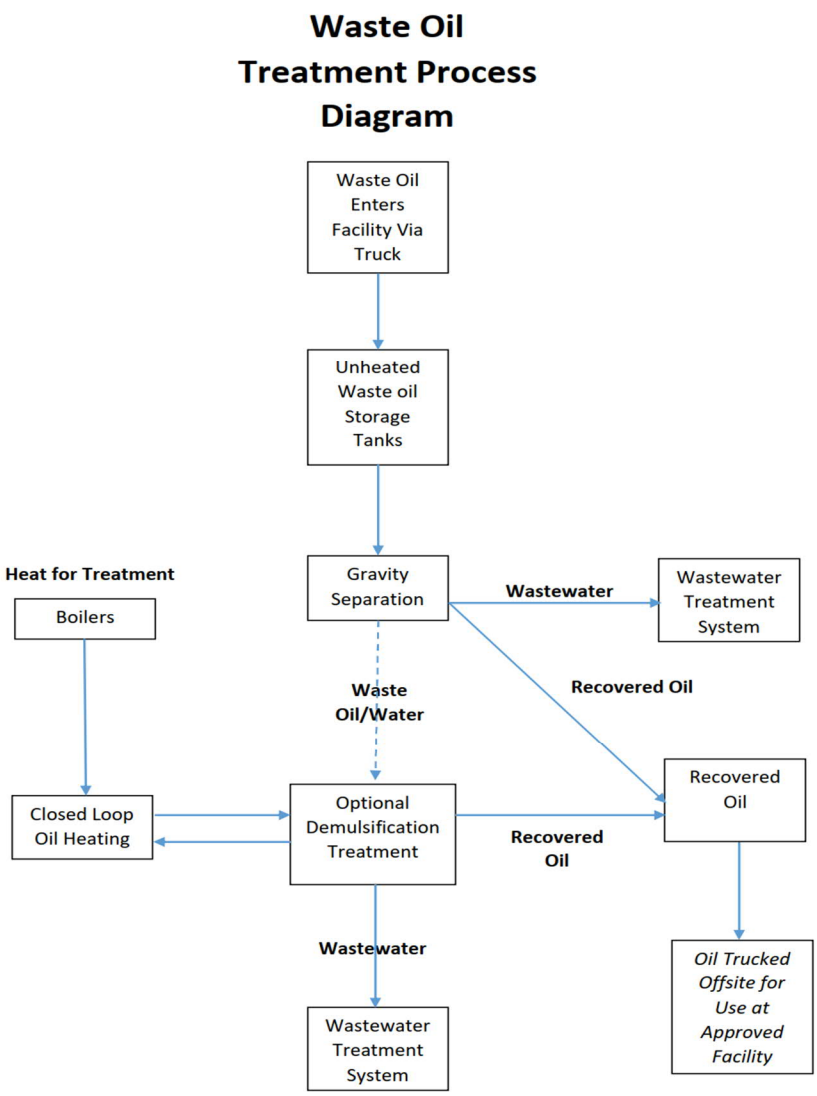


Figure 3-1: Waste Oil Treatment Process

In the gravity separation treatment process, waste oil is placed in a dedicated storage tank and any free water is allowed to naturally decant via gravity separation. After the gravity separation process, the separated water is drawn off and sent to the wastewater treatment system. The remaining waste oil is then sampled and analyzed for basic sediment and water (BS&W). If the BS&W exceeds 3% then the waste oil contains too much emulsified water to be recycled as fuel. The oil is then sent to the secondary treatment process (demulsification) for further refinement. If the BS&W content is below 3% then the oil is deemed "good quality" and trucked off-site for use at an approved facility for beneficial reuse.

In the demulsification treatment stage, the waste oil is heated via a closed loop heat exchanger from the on-site boilers and a demulsification chemical is added (if needed) in order to break the oil/water emulsion. Once the emulsion is broken, the free water separates via gravity as a separate phase and is removed and treated via the wastewater treatment process described in this section.

The demulsification process begins by transferring the waste oil into a 'Treater Tank', which consists of a vertical tank with a heating coil at the bottom. Once the Treater Tank is filled with waste oil, heating fluid (from the existing hot oil heaters) is allowed to pass through the coils and the waste oil is heated to 50 – 85°C (depending on the type of hydrocarbon in the waste oil). If needed, a chemical demulsifier is added to the waste oil to aid in the demulsification process. The demulsifier is biodegradable and safe for use and discharge to the marine environment.

The application of heat and/or demulsifier effectively breaks the emulsion and allows the remaining water to separate from the oil. The separated water is drawn off and sent to the wastewater treatment system for treatment while the remaining waste oil is then sampled and analyzed for BS&W. If the BS&W exceeds 3% then the treatment process is repeated. If the BS&W is <3% then the waste oil is transferred to an appropriate tank and shipped off-site for beneficial reuse.

3.4 Wastewater Treatment Process

Envirosoil's proposed wastewater treatment facility will accept and treat a variety of non-sanitary commercial and industrial wastewaters. The system is comprised of two treatment trains: Basic Treatment and Advanced Treatment. The Advanced Treatment process is an add-on/addition to the Basic Treatment train and is used for the treatment of specific contaminants and/or to achieve lower discharge requirements. All wastewater is sampled and tested when it enters the site prior to treatment, and depending on the sampling results, the wastewater will be treated via the Basic Treatment process only, or the Basic and Advanced Treatment processes combined.

The plant is designed such that the treatment train can be started and stopped as needed. This will allow the plant flexibility regarding discharge options. The plant is also capable of holding treated effluent for up to 48 hours if discharge needs to be temporarily suspended.

3.4.1 Basic Treatment Process

Envirosoil will mobilize all of the necessary equipment to allow for the effective installation and operation of the water treatment facility. The following components are expected to be required as part of the Basic Treatment train:

- Laboratory and Testing Equipment;
- Duplex Solids Filtration Unit;
- Dual Bag Solids Filtration Unit (Quantity: 2);
- Multi-bag Solids Filtration Unit (Quantity: 4);

- Fine Filtration Unit;
- Oil/Water Separator Unit;
- Activated Carbon Adsorption Unit;
- Organo-Clay Adsorption Unit;
- Zeolite Adsorption Unit;
- Flow meter;
- Online TPH, and Solids Analyzers;
- COD Analyzer;
- Pumps, Piping & Instrumentation; and
- PLC control system and data logger.

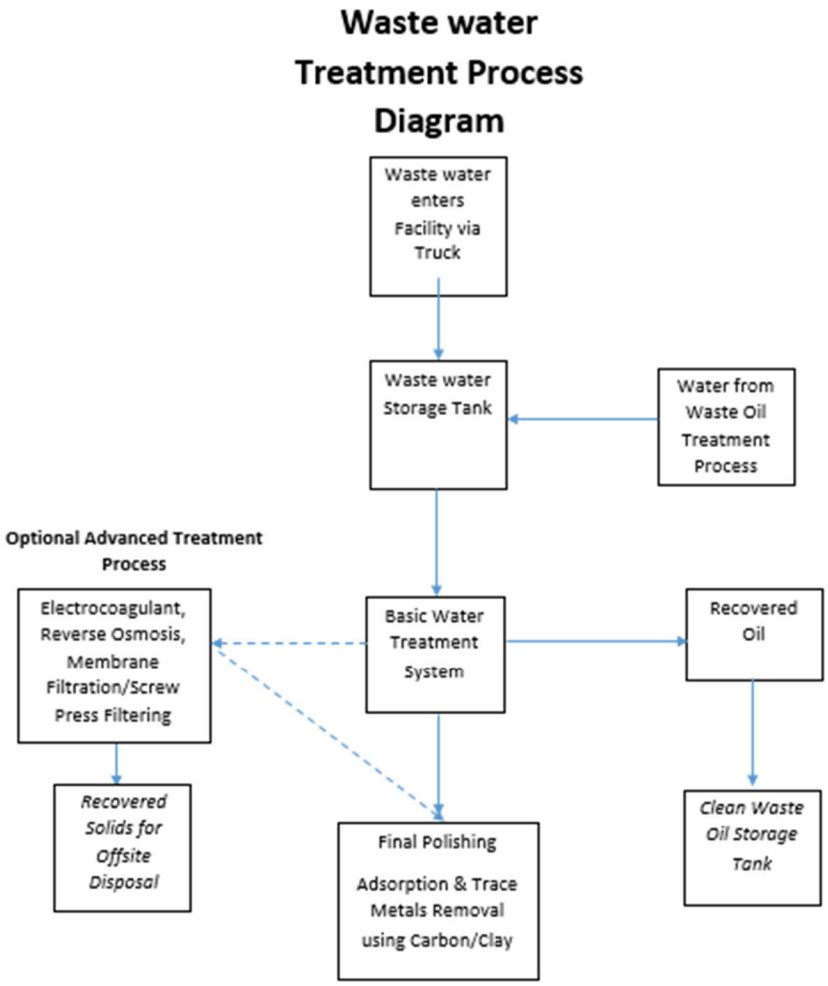


Figure 3-2: Wastewater Treatment Process

Wastewater enters the facility from truck unloading, and via piped connection from the waste oil treatment system. Wastewater is stored in the wastewater storage tanks and sampled prior to treatment, the results of which will indicate the necessary treatment process (Basic or Advanced).

From the wastewater storage tanks, wastewater is pumped through a staged 6-unit bag filter consisting of decreasing pore sizes to remove solids. The bag filters are staged in series with pore sizes ranging from 50 microns to 1 micron and can be changed to optimize treatment depending on the wastewater characteristics. The solids separated from the process are sampled, tested, and trucked to an approved facilities for further processing, depending on solids sampling results. The used bag filters are sent to an approved facility for disposal.

The wastewater that passes through the multi staged bag filter is then passed through the oil water separator. Oil drains by gravity from the top of the separator and is stored in an oil day tank to be pumped back to the waste oil treatment system. Treated wastewater can then enter the advanced treatment system or bypass to the wastewater polishing system. The wastewater polishing system consists of an organo-clay filter, two carbon filters, and zeolite filter for trace removal of metals and other contaminants. The spent carbon from the filters is destabilized and disposed off-site at an approved location. After polishing, the wastewater is passed through a 1-micron disposal bag filter.

The wastewater is sampled and tested at the on-site lab, along with online measurements for TSS, TPH, COD and BOD prior to discharge. Two options are available for wastewater sampling:

1. Continuous discharge with in-house lab testing on a regular basis (i.e., one sample per shift) with 10% confirmatory to accredited lab; or
2. Batch process until in-house lab data is received. 5% of the confirmatory samples are sent to an accredited lab.

Wastewater that does not meet the discharge requirements will be diverted to the start of the process for additional treatment. All wastewater is metered and recorded prior to discharge. In the event that TSS, TPH, COD or BOD readings exceed programmed criteria, online sensors, automatic valves and pumps will divert the effluent back to the start of the treatment process.

Table 3-1 below summarizes the basic treatment process equipment's risks and mitigation options.

Table 3-1: Preliminary Wastewater Treatment Design Parameters

Equipment	Risk	Mitigation
Laboratory and Testing Equipment	• Improper use of testing equipment	• Properly trained operators; • Enforced reporting practices; and • Samples sent to lab external accredited lab for confirmation.
Duplex Solids Filtration Unit	• Clogging of the baskets leading to poor performance.	• Regular maintenance to keep the basket strainer clean and functional; and • Automated PLC process that alerts operator of increase in differential pressure across filter which indicates the filter is getting plugged. Manufacturers typically recommend a 15 – 30 psi pressure drop, alarm will sound if exceeded.
Dual Bag Solids Filtration Unit	• Clogging or damage of the bag leading to poor performance.	• Regular maintenance to keep the bag filters clean and functional; and • Automated PLC alarm process that alerts operator of increase in differential pressure across filter which indicates the filter is getting plugged.
Multi-bag Solids Filtration Unit	• Clogging or damage of the bag leading to poor performance.	• Regular maintenance to keep the bag filters clean and functional; and • Automated PLC alarm process that alerts operator of increase in differential pressure across filter which indicates the filter is getting plugged.
Fine Filtration Unit	• Clogging or damage of the filter leading to poor performance.	• Regular maintenance to keep the filter clean and functional; and • Automated PLC alarm process that alerts operator of increase in differential pressure across filter which indicates the filter is getting plugged.
Oil/Water Separator Unit	• Poor oil separation leading to oil in the effluent; and • Leaks at the connections and/or tank.	• Maintenance/testing; and • Water discharge from OWS is sampled on daily basis. If TPH is increasing over time, then the system is shut down for cleaning. The OWS has a coalescing pack which helps in oil separation but may need to be cleaned every year or two.

Equipment	Risk	Mitigation
Activated Carbon Adsorption Unit	• Buildup within the activated carbon adsorption unit.	• The discharge is monitored for breakthrough and the material changed when this occurs. The spent material is sent for reuse in the Envirosoil operations, or disposal to an approved facility.
Organo-Clay/Zeolite Adsorption Units	• Buildup within the organo-clay/zeolite adsorption units.	• The discharge is monitored for breakthrough and the material changed when this occurs. The spent material is sent for reuse in the Envirosoil operations, or disposal to an approved facility.
Flow meter	• Incorrect flow measurement.	• Properly calibrate the flow meter at the manufactures specified frequency.
Online TPH, TSS, COD/BOD Analyzers	• Incorrect readings.	• Properly calibrate the analyzers at the manufacturer's specified frequency.
Pumps, Piping & Instrumentation	• Leaks; • Pump shutdowns; and • Instrument failure/ malfunctions.	• Complete pressure tests and wet commissioning prior to start-up; • Regular walk down the system to inspect for leaks; and • Include redundancies in case of emergency pump/instrumentation failure.
PLC control system and data logger	• Loss of data; and • Miscommunication from the systems instrumentation.	• Regularly back up data; and • Regularly check the calibration of the instrumentation.

3.4.2 Advanced Treatment Process

The Advanced Treatment train augments the capabilities of the Basic Treatment train by adding one or more of the following process/treatment equipment elements (the actual components included will be based on the treatment requirements):

- Electrocoagulation Unit;
- Reverse Osmosis Unit;
- Membrane Filtration Unit (Micro/Ultra/Nano);
- Flocculator Unit; and
- Screw/Filter Press Unit.

If required, an additional process step (i.e., Advanced Treatment) consisting of a polymer electrocoagulation, reverse osmosis or ultrafiltration system can be implemented, which enhances the removal of metals and other contaminants. A screw press may be employed to dewater any sludge generated from these treatment processes and the filtrate water is then passed on to the Basic

Treatment System. Components of this system will be selected based upon further assessment of wastewater streams and the system itself will meet all applicable regulations and discharge permit conditions.

If the Advanced Treatment, such as electrocoagulation, reverse osmosis or ultra-filtration is used, the solid effluent from the screw press will be trucked to Envirosoil or other appropriate and licensed treatment facility. Although the system will be primarily designed to handle hydrocarbon-contaminated wastewaters, it will be capable of treating a variety of miscellaneous contaminants. The facility will be capable of treating wastewaters containing compounds such as:

- Hydrocarbons;
- Suspended solids;
- Metals (i.e., lead, copper, zinc, etc.);
- Ammonia;
- Nitrite/nitrates;
- Low levels of BOD; and
- Low levels of COD.

Table 3-2 below summarizes the advanced treatment process equipment's risks and mitigation options.

Table 3-2: Preliminary Wastewater Treatment Design Parameters

Equipment	Risk	Mitigation
Electrocoagulation Unit	• Compromising effluent quality due to lack of cleaning/ maintenance; and • System failure/shutdown.	• Monitoring of current through EC "electrodes". PLC alarms and shutdowns if out of spec; • Regular and preventative maintenance to keep the electrocoagulation unit clean and functional; • PLC alarm can shut down unit is electrical current through electrodes is out of spec; or • Use alternative treatment path, and if that is not feasible, dispose any out-of-spec wastewater off-site to an approved facility.
Reverse Osmosis Unit	• Compromising effluent quality due to lack of cleaning/ maintenance; and • System failure/shutdown.	• Monitoring of differential pressure drop across the unit and flow by the PLC. Alarms and shutdown as required; • Regular and preventative maintenance to keep the RO unit clean and functional; or • Use alternative treatment path, and if that is not feasible

Equipment	Risk	Mitigation
		discharge any out-of-spec wastewater off-site.
Membrane Filtration Unit (Micro/Ultra/Nano)	• Buildup and plugging; and • System failure/shutdown.	• Monitoring of differential pressure drop across the unit and flow by the PLC. Alarms and shutdown as required; and • Use alternative treatment path, and if that is not feasible discharge any out-of-spec wastewater off-site.
Flocculator Unit	• Compromising effluent quality due to lack of cleaning/ maintenance; and • System failure/shutdown.	• Regular and preventative maintenance to keep the flocculator unit clean and functional; or • Use alternative treatment path, and if that is not feasible discharge any out-of-spec wastewater off-site.
Screw/Filter Press Unit	• System failure/shutdown.	• Regular and preventative maintenance to keep the screw press unit clean and functional; or • Discharge any out-of-spec waste off-site.

3.4.3 Influent Quality and Quantity

The wastewater treatment system is designed based on the following general process parameters:

Table 3-3: Preliminary Wastewater Treatment Design Parameters

Parameter	Average Concentration	Maximum Concentration
Flow rate (m^3/year)	16,000	20,000
Free Liquid Hydrocarbons	100,000	250,000
Dissolved Hydrocarbons	3,000	6,000
Emulsified Hydrocarbons	600	1,000
Total Suspended Solids	5,000	10,000
COD (mg/L)	1,500	2,500
BOD (mg/L)	700	1,200
TKN (mg/L)	250	450
pH (mg/L)	4-9	2-11

Table 3-3 presents the expected normal and maximum inlet contaminant concentrations at the specified flow rates under normal anticipated operational parameters. These inlet concentrations do not represent the maximum or upper limit that the system is capable of treating. The system can effectively treat higher levels of inlet contaminant concentrations by decreasing the flow rate and/or modifying individual treatment component process parameters.

Incoming wastewater to the plant will be treated based on wastewater type and quantity. Bilge waters containing high concentrations of chlorides, for example, would be treated so it can be discharged to the Halifax Harbour. Chlorides could be removed through a process such as reverse osmosis, however this is extremely energy intensive and would require offsite hauling of the filter reject, essentially concentrated salts. As the source of the bilge chlorides is natural (seawater) and there is no chloride limit within the CCME water quality guideline for MAL, we consider it appropriate to return it back to the harbour rather than increasing the carbon footprint of the facility.

4.0 Applicable Regulations and Bylaws

The treatment facility will be located at 750 Pleasant Street in Dartmouth, Nova Scotia and discharge will be directed to the Halifax Harbour, within relatively close proximity to where the nearest Halifax Water plant discharges (Eastern Passage WWTP), as well as surface water runoff to the storm sewer system on Pleasant Street. Federal guidelines are considered applicable for discharge to a marine environment, and specifically the Halifax Harbour. The applicable bylaws, regulations and acts are:

- CCME Water Quality Guidelines for the Protection of Marine Aquatic Life;

A summary of key CCME guidelines can be found in Tables 4-1.

To verify the composition of wastewater after the plant begins processing, a minimum of four 24 hour composite samples (three during the work week (Monday to Friday) and one on the weekend) should be collected and analyzed for the requirements of the operating permit. This can also be supplemented with random grab samples throughout any given day and analyzed at the in-house lab. Routine sampling will be completed at the site's laboratory described earlier and tested for key parameters and those that may indicate issues with the treatment system.

ECCC and NSE have final discretion regarding which effluent parameters need to be monitored regularly, based on substances of potential concern associated with the raw wastewater. A proposed key parameter summary is presented below based on the facility receiving largely bilge and other shipping wastewater:

Table 4-1: CCME MAL Key Parameter Summary

Parameter	Units	CCME Limit*
5-day Biochemical Oxygen Demand (BOD_5)	mg/L	No prescribed limit*, Applicant proposes 15 mg/L (similar to stormwater bylaw)
Total Cadmium	ug/L	0.12
Chemical Oxygen Demand (COD)	mg/L	No prescribed limit*
Total Mercury	ug/L	0.016
Total Suspended Solids	mg/L	Max increase of 25 mg/L above background levels (24 hour period). Max increase of 5 mg/L for longer term exposures. During high flow events, a max increase of 25 mg/L above background levels when they are between 25 and 250 mg/L. No more than 10% of background if background levels are > 250 mg/L
Ethylbenzene	ug/L	25
Toluene	ug/L	215
Tributyltin	ug/L	0.001
pH	-	7.0 – 8.7

5.0 Management Practices

The following sections describe the operation and maintenance, pressure testing, and waste management practices.

5.1 Operation and Maintenance

Project operations can be generally grouped under the following activities:

- Pre-delivery product analysis review: receipt of waste profile sheet from shipper, describing source, laboratory analysis of waste, volume, etc.;
- Field sampling and analysis;
- Monitoring and process control;
- Heating: hot oil heating system;
- Storage: tanks, piping & valves;
- Delivery: truck loading system (Envirosoil's operation ends when trucks leave the site); and
- Preventative maintenance and inspections.

Product receiving, storage, processing/treatment, loading, transfer and handling will be contained fully at the site. Envirosoil staff will ensure that whenever products are being transferred, it will be supervised by trained personnel at all times and in such a manner that the flow of products can be immediately shut off, if necessary. The operator controls the storage, receiving, and delivering process using various flow meters, level indicators and valves based on the demand of the facility. PLC controlled level sensors will also sound alarms and shut the system down based on predetermined set points. All facility processes and equipment will meet the applicable standards and codes. Each general operational activity is described in the following subsections.

5.1.1 Pre-delivery Product Analysis

In order to ensure that material accepted at the facility can be effectively treated, all materials entering the proposed treatment system will require a pre-delivery product analysis (e.g., laboratory confirmation) review from the shipper before they are received. In the event that materials are received that do not meet specifications appropriate for treatment and recycling through the facility's process, materials will be returned to the shipper within 72 hours.

5.1.2 Field Sampling and Analysis

Each batch of wastewater in the holding tanks will be analyzed prior to treatment through the on-site laboratory which is located immediately adjacent the control room within the main building. Lab and online testing equipment is state of the art, using approved or accepted methods (if applicable) and industry proven. A dedicated and trained laboratory technician will be on site and operating the laboratory on a full-time basis.

Envirosoil is proposing to use laboratory instruments manufactured and managed by Hach® (or equivalent), including: TSS sc digital probe for suspended solids in aqueous, and also aggressive, media. It is ideal for high temperatures and pressures, for hygienic environments or for corrosive media. This instrument connects to the manufacturer's online system enabling seamless connection and management of instruments, data, and processing in real-time (refer to Appendix B for product specifications).

With UV and Visible Spectrum capabilities and over 250 pre-programmed methods including the most common testing methods used, guided procedures, and integrated quality assurance software, the new spectrophotometer for laboratory and photometry applications will also be employed. It will be used for parameters such as select metals, surfactants and nutrient parameters. Hach's vials will be used for compatibility and to reduce errors, meet reporting standards, and to perform proficiency testing with higher confidence (refer to Appendix B for product specifications).

For initial demonstration of performance or capability, a set of samples will be analyzed to determine the performance of a new analytical method before the laboratory analyst or technician runs the first analytical batch. This will involve method detection limit (MDL) and initial precision and recovery (IPR) studies. Quality assurance samples will also be run on a routine basis with each analytical batch, and may include laboratory reagent blanks, ongoing precision and recovery, duplicate samples, matrix spikes and spike duplicates.

Analytical methods that will be employed by the on-site laboratory will be United States Environmental Protection Agency approved and accepted, or equivalent. The USEPA establishes limits for maximum contamination levels or certain constituents in water, and also requires that specific methodology be used to analyze for these constituents. The USEPA will often be supported in developing these methods, as well as evaluate the methods developed by public agencies and manufacturers, including Hach®. When a method meets the USEPA criteria, it is approved. In other instances, procedures may be equivalent to USEPA approved methods, even though minor modifications may exist. In this case, the USEPA has reviewed and accepted certain procedures for reporting purposes.

Envirosoil also adheres to the sampling, analysis and QA/QC procedures outlined in Ontario's *Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater* (v2.0). This protocol was developed to provide guidelines for Ontario's provincial Ministry of the Environment and Climate Change (MOECC) programs and to specify requirements for compliance with Ministry regulations and/or Environmental Compliance Approvals (ECA).

In addition to the on-site laboratory, the analytical program will be supplemented with 10% of confirmatory samples being sent to independent labs such as AGAT or Bureau Veritas for third-party verification.

Prior to wastewater discharge from the facility, Envirosoil will be employing MANTECH's PeCOD® COD/BOD Analyzer technology which provides accurate chemical oxygen demand (COD) or biochemical oxygen demand (BOD) results in as little as 10 minutes (BOD results based on a predetermined ratio of COD:BOD). This technology is used for in-plant process and effluent monitoring, and operates without the use of harmful chemicals including dichromate and mercury. It is highly adaptable for both wastewater and drinking water applications and can be configured to accommodate process operations, automated sampling, or continuous process monitoring, combining robust performance and flexibility. It is known to be successfully operated in a number of local applications, including a local university, municipality, brewery and pharmaceutical manufacturer.

5.1.3 Monitoring and Process Control

The proposed system uses advanced sensing, monitoring, alarms and PLC control to control fluid flow tanks levels and treatment processes. These sensors and systems feed into the control room where an operator will be stationed during all treatment operations.

To ensure that recycling and treatment processes are maintaining acceptable recovered oil and water quality standards, an on-site laboratory will be located beside the control room. In addition to this on-site laboratory, there are several in-line water quality sensors that can provide logged quality information for record keeping and process control. These include, but are not limited to:

- Water Discharge Totalizer;
- In-line Total Petroleum Hydrocarbon Analyzer;
- In-line COD/BOD analyzer;
- Sampling ports; and
- Total Suspended Solids Analyzer.

These in-line computerized systems, combined with the on-site laboratory and testing equipment can provide Envirosoil with all the required testing and instrumentation to ensure Envirosoil meets and/or exceeds all relevant permit conditions and legislative requirements for treatment and product discharge. If the treated wastewater test results identify that the effluent is in exceedance of the quality requirements, the PLC will automatically divert the water to the beginning of the process, shut down the system and sound an alarm. For QA/QC purposes, samples of treated water will also periodically be sent to an accredited lab for third party verification.

5.1.4 Heating

An existing closed-loop hot oil system will be used to heat the treater tanks. Paratherm NF Heat Transfer Fluid will be used. It is a food grade, mineral-oil based heat transfer fluid designed for extended service

in closed-loop liquid-phase systems. The fluid is circulated through the tank's hot oil distribution system and is heated by the boiler. A total of 4.2 m^3 of Paratherm NF is proposed to be used in this system.

The proposed undertaking will use the existing HC and HCS bro 8-90 (HC 300-3 million BTU) boilers made by Heatec. The heaters are 3 MMBTU/hour and will increase the temperature of the heating fluid to approximately 200ºC. Natural gas for the boilers will be supplied by Heritage Gas.

5.1.5 Storage

There are four types of storage that will be required for this proposed project:

- Unheated wastewater storage (existing, 4 tanks x 55,000 L);
- Recovered oil storage tanks (existing, 2 tanks x 55,000 L, 1 tank x 3,170 L);
- Storage tanks (exterior to building, 6 tanks x 90,000 L); and
- Clean water storage tanks (in building, 2 tanks x 55,000 L).

Other tanks will be used for actively treating effluent, such as the heated treater tanks. The unheated wastewater storage tanks, recovered oil storage tanks and the clean water storage tanks are each managed by a modern, industry standard PLC. The system uses traditional float switches and an advanced radar system to ensure tanks are not overfilled and the process is monitored at all times.

5.1.6 Delivery

Trucks entering the site will typically be tankers that meet the provincial capacity regulations, which can range by province from 35,000 to 48,000 L. They will enter the site from Pleasant Street through a controlled security gate and drive down to a weigh-in scale. An industry standard vehicle and operator tracking system will be in place to ensure only trained drivers are allowed on-site and that the trucks are properly loaded and documented. Volume of product is controlled through the use of a flow meter, and there will be a dedicated pump and piping for this operation. Loading areas are designed to provide positive drainage and effective protection against discharge of contaminants to stormwater and underlying systems. Trucks are also required to be grounded and have the wheels chocked during any loading. All transfer processes will be equipped with emergency shut off switches.

A weigh scale is used to weigh the delivery trucks before and after loading to ensure compliance with local and provincial road restrictions. Standard operating procedures (SOPs) will be complied with by staff and drivers while on-site. Adherence to SOPs has been ongoing at Envirosoil's primary operating facility in Bedford for over 25 years with a proven track record of successful execution. Personnel will be required to wear appropriate PPE while at the site and during any product transfers. For personnel new to the site and its operations, a safety briefing and orientation will be required prior to starting work.

5.1.7 Preventative Maintenance and Inspections

The preventative maintenance program will be performed in an effort to prevent breakdowns and failures by adjustment, repair or replacement of equipment and parts. Equipment and systems preventative maintenance includes:

- Maintaining, calibrating and servicing online monitors for TPH, TSS COD and BOD, and high level alarms on all storage tanks;
- Verification of operation of all process control elements including pressure, temperature, flow rate, liquid level and emergency shutdown valves;
- Asset integrity inspections of all product transfer pipelines and storage tanks. Tank supports, and foundations are included within asset integrity inspections. Inspections will be conducted per all applicable standards and/or manufacturer recommendations;
- Operations personnel conduct multiple daily rounds of the project area; and
- Safety and Emergency Response assets are inspected regularly.

5.1.7.1 Daily Inspections

Inspections of all storage tanks, piping and associated equipment and secondary containment areas are completed by personnel on their rounds daily and documented on a checklist.

5.1.7.2 Monthly Inspections

Once per month, a detailed tank inspection is performed at the facility. Completed inspection checklists are retained at the facility for a minimum of five years. Inspection standards will be developed and implemented as part of the site-wide maintenance plan that will be developed once the facility design is finalized.

Emergency response equipment is also inspected monthly for deterioration and operability and records are maintained on site.

5.1.7.3 Five-year Inspections

Every five years, tanks shall be externally inspected as per API Standard 653.

5.1.7.4 Ten-year Inspections

Every ten years, tanks shall be internally inspected as per API Standard 653.

5.2 Wet Commissioning

5.2.1 Hydrostatic Testing

Prior to receiving wastewater, all tanks and vessels that are to contain wastewater shall be hydrostatically tested with clean water and inspected for any leaks. All leaks will be resolved prior to the introduction of wastewater to the system.

5.2.2 Pressure Testing

Prior to receiving wastewater, all pipes that will experience pressurized flow during normal operation of the wastewater treatment system shall be pressure tested with clean water and inspected for any damage and leaks. All leaks shall be resolved prior to the introduction of wastewater to the system.

Pressure testing will be conducted in accordance with Halifax Water's guidelines and following the plant start-up and commissioning plan to be developed and manufacturer's recommendations for specific pieces of equipment.

5.3 Waste Management Practices

5.3.1 Liquid and Hazardous Wastes

Liquid wastes generated during installation of system components may include oils, grease and fuels from trucks delivering project components and other mobile equipment used to move and install those components, plus any inadvertent fuel spills. These wastes will be collected and disposed of in accordance with applicable local and provincial regulations. Liquid wastes from construction crews, including sewage and domestic wastewater, will also be collected and disposed of consistent with local and provincial standards.

Liquid wastes typically produced during operations and maintenance will be primarily treated water from the water treatment process. Treated water will be directed towards the harbour or storm sewer based on lab testing results and chloride concentrations. Prior to facility operation, provincial approvals to operate will be obtained to discharge.

Other anticipated liquid wastes include lube oil for the pumps and other mechanical equipment which will be changed regularly. This waste stream will either be incorporated into the recovered oil from the main system or if blending is not possible, be removed from the site in barrels, for delivery to an approved disposal and/or recycling facility.

5.3.2 Solid Wastes

Solid wastes generated during installation may include extra subsoil, temporary fencing, signs, metal containers, canisters as well as welding rods, and domestic wastes. Scrap paper and other office wastes will also be generated. During operation and maintenance, a limited amount of solid wastes may be generated in addition to other solid wastes that are produced during daily operation of a typical small office environment and industrial facility. The wastewater treatment process will generate activated carbon, used organo-clay and used bag filters as solid waste stream items, all sent to approved facilities for disposal and/or reuse. If the Advanced Treatment option is employed, there may be some sludge residual (<10% of any volume treated depending on the technology utilized).

Similar to existing operations at the subject site, Envirosoil will continue to actively cooperate with municipal waste reduction and recycling programs and will encourage conservation throughout its facilities. Solid wastes will be collected and disposed of in a manner consistent with local and provincial standards. Non-hazardous wastes will be separated as recyclable and non-recyclable, with recyclable material collected and transported to a licensed recycling facility. Non-recyclable wastes will be disposed of according to Envirosoil's existing waste management procedures.

6.0 Emergency Protocols

6.1 Emergency Response and Contingency Plan

In the case of an accidental release of materials, reporting and clean-up procedures will follow provincial emergency spill regulations as required. Lubricants and other petroleum products will be stored and waste oils will be disposed of in accordance with provincial regulations. Small spills will be contained by on-site personnel using spill kits kept at the site. It is anticipated that elements of the ERCP will include:

- Purpose and scope of plan coverage;
- General facility identification information (e.g., name, owner, address, key contacts, phone number);
- Component and infrastructure locality information (e.g., maps, drawings, description, layout);
- Discovery/initial response;
- Termination and follow-up actions/prevention of recurrence;
- Notification protocols (internal, external, and agencies);
- Response management system (e.g., incident commander, safety, liaison, evacuation plan);
- Assessment/monitoring, discharge or release control;
- Containment, recovery, and decontamination;
- Logistics – medical needs, site security, communications, transportation, personnel support, equipment maintenance and support, emergency response equipment (e.g., personal protective equipment (PPE), respiratory, fire extinguishers, first aid);
- Incident documentation (accident investigation and history);
- A description of biological and human-use resources that could be impacted;
- An inventory of oil and chemical products and associated storage locations for both construction and operation phases;
- The identification of spill response equipment that will be on-site or available in case of emergency events;
- Procedures for responding to operational spills and releases;
- An incident reporting system, including notification and alerting procedures;
- A list of responsible organizations and clarification of the roles of each organization;
- Clean-up and disposal procedures;
- Training and exercises/drills;
- Plan review and modification; prevention;
- Regulatory compliance; and
- A log of all maintenance activities of critical emission control devises will be maintained. The log will record the following:
  - Identification of the unit;
  - Time/date of log entry;
  - Nature of event;

- Time and duration of event; and
- Action taken.

The ERCP will also reference relevant and appropriate standards to supplement code requirements as applicable. Envirosoil commits to submitting a Final ERCP to appropriate regulatory agencies for review prior to operations.

For additional emergency response support, Envirosoil intends to work with industry service providers such as ECRC (Dartmouth), Terrapure Environmental (Dartmouth), and CleanEarth Technologies (Goffs, NS). Envirosoil also has access to internal emergency response team locally (Rocky Lake Drive, Bedford) that is available to respond to incidents during the project. The capacity of local fire and ambulance services to respond to incidents has been evaluated during preparation of the draft ERCP. Envirosoil will continue to work closely with related agencies on the issue of public safety during all phases of the project.

6.2 Accidents, Malfunctions and Unplanned Events

This section identifies accidents, malfunctions, or unplanned events that could occur during any phase of the proposed project. The assessment focuses on events that are considered credible based on the project description and the experience of the assessment team in evaluating similar projects.

Contingency planning is a key component of Envirosoil's approach to its existing operations. Envirosoil has developed detailed operational procedures to guide its everyday operations, and has developed contingency and emergency response procedures to quickly process upsets or abnormal operating conditions while limiting environmental effects. Various emergency scenarios will be incorporated in planning for operation of the project, including potential for failure and repair.

The proposed operation will have robust emergency response and contingency plans with respect to accidents and malfunctions. The implementation of spill containment measures and experienced staff with thorough training will significantly reduce the likelihood of accidents and malfunctions at this site. Spill containment measures will be implemented on areas where spills or leakages are likely to occur, specifically in the loading/unloading and processing areas. Fire, spill, and medical response plans will be in place to address potential accidents or malfunctions that may arise from operations, and will be amended during NSE's Industrial Approval application process to include any specifics necessary for effective management of the proposed operations.

6.2.1 Approach

The general approach to assessing the potential environmental effects of the selected potential accident, malfunction, or unplanned event scenarios involves the following:

- Describing the potential accident, malfunction, or unplanned event;

- Considering if the potential accident, malfunction, or unplanned event could occur during the life of the project, and during which phase(s) or activity(ies);
- Describing the project planning and safeguards established to minimize the potential for such occurrences to happen;
- Consideration of the contingency or emergency response procedures applicable to the event; and
- In consideration of the above, assessing the residual environmental effects of accidents, malfunctions, and unplanned events on surface water or other features, and determining the significance of the potential residual environmental effects of these accidents, malfunctions, or unplanned events (and their likelihood of occurrence, as applicable).

This section assesses the environmental effects of each of the credible accidents, malfunctions, and any unplanned event identified, and identifies mitigation measures to address the potential residual environmental effects.

6.2.1.1 Accidental Release of Hazardous Materials

An accidental release of fuel or other liquid hazardous materials (e.g., petroleum, oil, lubricants - POL) used in vehicles or equipment on-site may occur during refuelling of machinery or trucks as a result of human error or equipment malfunction during construction activities. During operation of the facility, there is potential for release of chemicals used in operations as well. Such a spill may contaminate soils and groundwater and, through runoff, contaminate surface water resources.

The accidental release of a hazardous material through a spill could affect primarily surface water resources, groundwater, soils and air quality on a temporary and localized basis. Untreated wastewater or fuel spills may enter a waterbody potentially affecting water quality and fish and their habitat, with the extent of effects depending upon the quantity released.

Mitigation

- Key mitigation to prevent an accidental release of a hazardous material is described in the provincial Environmental Assessment Registration Document - **Section 5.8** – Standard Mitigation Measures (refer to: https://novascotia.ca/nse/ea/Waste-Oil-Recycling-and-Water-Treatment-Facility).

Potential Residual Environmental Effects

With spill containment provided during operation and maintenance, and careful implementation of best practices, the risk of spills resulting during both construction and operation and maintenance phases of the project is expected to be low. The risk of contamination from spills and leaks during the operation and maintenance phase will be reduced further by preventive measures, contingency planning and spill response and mitigation. Based on the project's design, and with the implementation of mitigation measures, contingency and emergency response procedures, and best practices, the potential residual environmental effects of an accidental release of a hazardous material during all phases of the project are not significant, with a high level of confidence.

6.2.1.2 Accidental Release of Untreated Wastewater and/or Petroleum Hydrocarbons

An accidental release of waste oil, untreated wastewater and/or petroleum hydrocarbons could occur at the transfer locations or within the processing area, during the operation and maintenance phase of the project. An accidental release may be the result of equipment failure, human error, or material failure. A release of untreated wastewater or petroleum hydrocarbons from the transfer areas or process area could affect soil or water quality (surface water) if not contained. A release of untreated wastewater and/or waste petroleum hydrocarbons from the transfer locations or processing area could affect soil or water quality (groundwater or surface water).

Mitigation

Key mitigation to prevent an accidental release of untreated wastewater and/or waste petroleum hydrocarbons includes:

- Transfer of waste water and waste oil will only occur on a containment pad;
- Trained operators will control the transfer of material form delivery trucks via pumps;
- Receiving tanks will be equipped with high-level float which will terminate pumping if the high-level condition is reached to eliminate the potential for overfill;
- Operation of the facility will include regular inspection of all piping, hoses and tanks for leaks or potential points where a leak could occur, such as fractures and breaks;
- Storage tanks will be inspected, repaired and reconfigured in accordance with API 653 – Tank Inspection, Repair, Alteration and Reconstruction;
- External tanks have a dike capable of holding 100% of the largest tanks capacity + 10% of each additional tank;
- Water from the exterior tank berm is passed through an underground Oil Water Separator prior to discharge to sewer. The Oil Water Separator is designed to meet all required discharge limits;
- The project area is fully secured by fencing reducing the risk of intentional vandalism to the facility and its components;
- Over 300 m of 18" fence boom (as well as all the necessary support equipment) will be located at the site (consistent with the contingency measure for the existing asphalt storage facility at the same site) and will be immediately available if required in the event of a spill. The pre-planned and expedient deployment of this boom would minimize the effects of any spills to the marine environment; and
- Routine influent and effluent testing for key parameters and indicator surrogates that will aid in quickly identifying a process failure.

Facility operations personnel will be given adequate training and orientation to allow them to perform their jobs safely and to respond to minor spills and leaks. Employees will be informed of potential hazards and safe operating procedures and will be familiar with the facility's Site Safety Plan and Safety Data Sheets (SDSs) for products used and stored at the site.

Potential Residual Environmental Effects

Regular inspection of all components in industrial facilities is a standard component of a management system (e.g., SOPs) to prevent costly and potentially damaging leaks. Identifying potential issues early though an inspection plan allows for repairs or replacement of problem sections before a release occurs. Through the implementation of an inspection plan, the potential residual environmental effects of an accidental release of wastewater and/or petroleum hydrocarbons to the environment during all phases of the project are not significant, with a high level of confidence.

6.2.1.3 Accidental Release of Excessive Quantities of Wastewater

An accidental release of excessive quantities of wastewater to be discharged could occur during the operation or during a rain or heavy precipitation event. The majority of the system is housed in-doors and any exterior tanks are located within a lined containment dyke. An accidental release may be the result of equipment failure or human error. A release of excessive wastewater from the wastewater treatment facility could affect the water quality at the discharge location and/or water quality (surface water) if not contained.

A new industrial oil water separator will be installed adjacent the proposed tank farm and will discharge treated effluent to Halifax Water's storm sewer system.

Mitigation

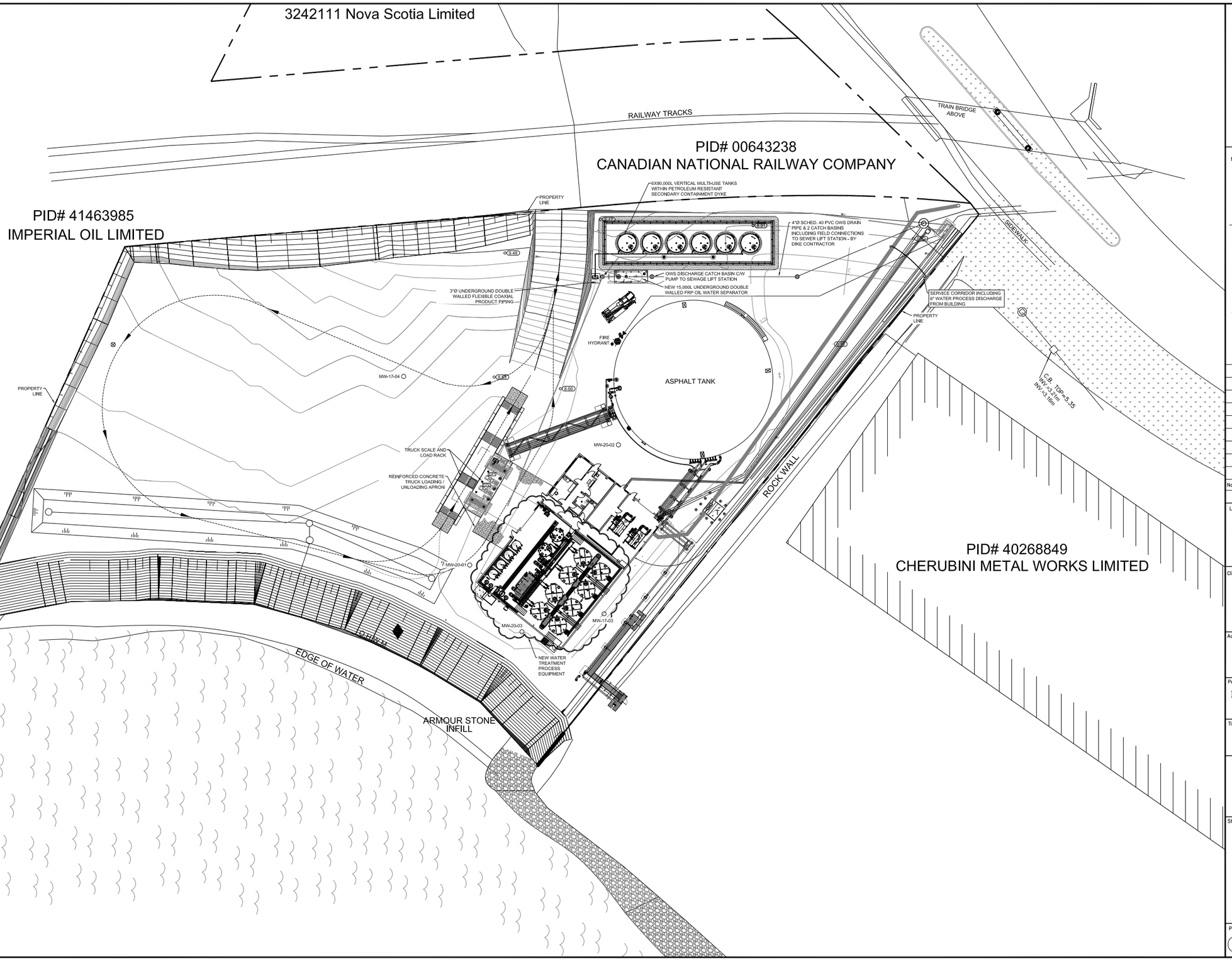
- Flow meters, pumps and control systems will be closely monitored and regularly inspected, repaired, and replaced, as required;
- Pump flow rates will be monitored to maintain an acceptable level of wastewater flow throughout the treatment system; and
- Trained operators will monitor outgoing wastewater quantities.

Potential Residual Environmental Effects

Through the implementation of mitigation measures as well as containment for all processes on site, accidental release of excessive quantities of wastewater to Halifax Water or the environment is not expected. Discharge from site is done on an as-required basis based on the incoming water quantities and does not allow for uncontrolled continuous flow, preventing unforeseen excess discharges. It is important to consider, and as a relative comparison, that the Eastern Passage WWTP is rated to discharge up to 25 ML/d, approximately 1500m away from the Pleasant Street site. In comparison, the proposed plant will discharge on average only 0.04 ML/d.

Appendix A

Drawings



ISSUE

	FOR	BY	DATE
☐	– FOR REVIEW ONLY		
■	– FOR APPROVAL	TJG	MAR 30, 2021
☐	– FOR TENDER		
☐	– FOR CONSTRUCTION		
☐	– FOR AS BUILT		

NOTES:

- INSTALLER TO VERIFY LOCATION OF BUILDING AND PROPERTY LINES BEFORE BEGINNING WORK
- INSTALLER TO CHECK SITE FOR EXISTING SITE SERVICES SUCH AS: WATER AND SEWER LINES, ELECTRICAL LINES, ETC... PRIOR TO ANY EXCAVATION.
- ALL EQUIPMENT TO BE INSTALLED AND TESTED AS PER MANUFACTURES RECOMMENDATIONS
- INSTALLATION WORK TO BE COMPLETED IN ACCORDANCE WITH ALL APPLICABLE CODES.
- THIS PETROLEUM STORAGE SYSTEM CONFORMS TO ALL APPLICABLE ULC REQUIREMENTS AND STANDARDS INCLUDING ULC-S601, "SHOP FABRICATED STEEL ABOVEGROUND VERTICAL TANKS FOR PETROLEUM PRODUCTS," AND API 650 "WELDED STEEL TANKS FOR OIL STORAGE", LATEST EDITION.
- THIS DESIGN HAS ADDRESSED THE ISSUE OF POSSIBLE COLLECTION OF FLAMMABLE VAPOUR AND/OR LIQUID IN UNDERGROUND SUMPS.
- ALL WORK TO BE COMPLETED BY A PETROLEUM INSTALLER LICENSED BY THE PROVINCE OF NOVA SCOTIA.
- CONTRACTOR SHALL VERIFY ALL DIMENSIONS PRIOR TO COMMENCING WORK.
- ALL TANKS TO BE INSTALLED LEVEL

CONCRETE SPEC:

32MPa
5%-8% AIR
400MPa REBAR YIELD STRENGTH
80mm SLUMP

No.	DESCRIPTION	BY	DATE

REVISIONS

Logo: envirosoil ISO 14001 · ISO 9001

Client: ENVIROSOIL

Address: PLEASANT STREET
DARTMOUTH, NS

Project: NEW WASTE OIL RECYCLING & WASTE WATER TREATMENT FACILITY

Title: SITE PLAN

GALLAGHER TECHNICAL SERVICES LIMITED
22 DOUGLAS DRIVE
QUISPAMSIS, NB
E2G 1Y3
PHONE: 506 849 4116
FAX: 506 847 1070

Stamp:

DESIGN:
DRAWN:
CHECKED:
DATE: MAR 30, 2021
SCALE: 1" = 30'-0"
REV.: △

PROJECT NUMBER: GTS-1645

SHEET No. 1

WASTEWATER FROM FLOOR TRENCH #2

WASTEWATER FROM SUCTION HOSE / CATCH BASIN ETC

WASTEWATER FROM TRUCK UNLOADING

COARSE RIGID DUPLEX BASKET STRAINER

DUAL BAG FILTERS

MICROMOTION METER

COMP AIR TO TREATMENT AREA

ATM VENT

OILY WATER

CAMLOCK

RECOVERED OIL

DRAWN OFF WATER FOR FURTHER TREATMENT

DUAL BAG FILTERS

HOT OIL TO TREATER TANKS

HOT OIL BACK TO BOILER

BUNKER BUSTER FROM TOTE TO TREATER TANKS

CHEMICAL METERING PUMP

1500–2000LB SCRUBBER UNIT

MIXER MOTOR

VENT

TREATER TANK

MIXER

TREATER TANK BYPASS

RECOVERED OIL

TREATER TANK DRAWN OFF WATER FOR FURTHER TREATMENT

ATM VENT

PLC

MICROMOTION METER

RECOVERED OIL

CLEAN WATER

MICROMOTION METER

TO SANITARY

DISCHARGE TOTALIZER

CLEAN OIL TO TRUCK SCALES

HOSE CONNECTION TO OILY WATER TANKS

HOSE CONNECTION TO OILY WATER TANKS

TPH ANALYZER

TSS ANALYZER

ANALYZER BYPASS

TPH ANALYZER DISCHARGE DAY TANK

TREATMENT LOOP BACK TO TREATER TANKS

COMP AIR

GRAVITY DRAIN

OIL DAY TANK

OIL WATER SEPARATOR / DAF UNIT

MICRO BUBBLER

OIL WATER SEPARATOR BYPASS

6 UNIT BAG FILTER

POLYMER FROM TOTE TO PROCESS

POLYMER METERING PUMP

M

OPTIONAL ENHANCED TREATMENT

SECONDARY ENHANCED TREATMENT

6 UNIT BAG FILTER

EC BYPASS

STATIC MIXER

SCREW PRESS

SLUDGE TO DUMPSTER

GRAVITY DRAIN

SCREW PRESS BYPASS

HPV

CLAY FILTER

CARBON FILTER #1

CARBON FILTER #2

METALS FILTER

6 UNIT BAG FILTER

CLEAN WATER DAY TANK

METER

6 UNIT BAG FILTER

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400MPa REBAR YIELD STRENGTH
80mm SLUMP

No.	DESCRIPTION	BY	DATE

REVISIONS

Logo: envirosoil ISO 14001 • ISO 9001

Client: ENVIROSOIL

Address: PLEASANT STREET DARTMOUTH, NS

Project: NEW WASTE OIL RECYCLING & WASTE WATER TREATMENT FACILITY

Title: SIMPLIFIED PROCESS FLOW DIAGRAM

GALLAGHER TECHNICAL SERVICES LIMITED
22 DOUGLAS DRIVE
QUISPAMSIS, NB
E2G 1Y3
PHONE: 506 849 4116
FAX: 506 847 1070

Stamp:

DESIGN:

DRAWN:

CHECKED:

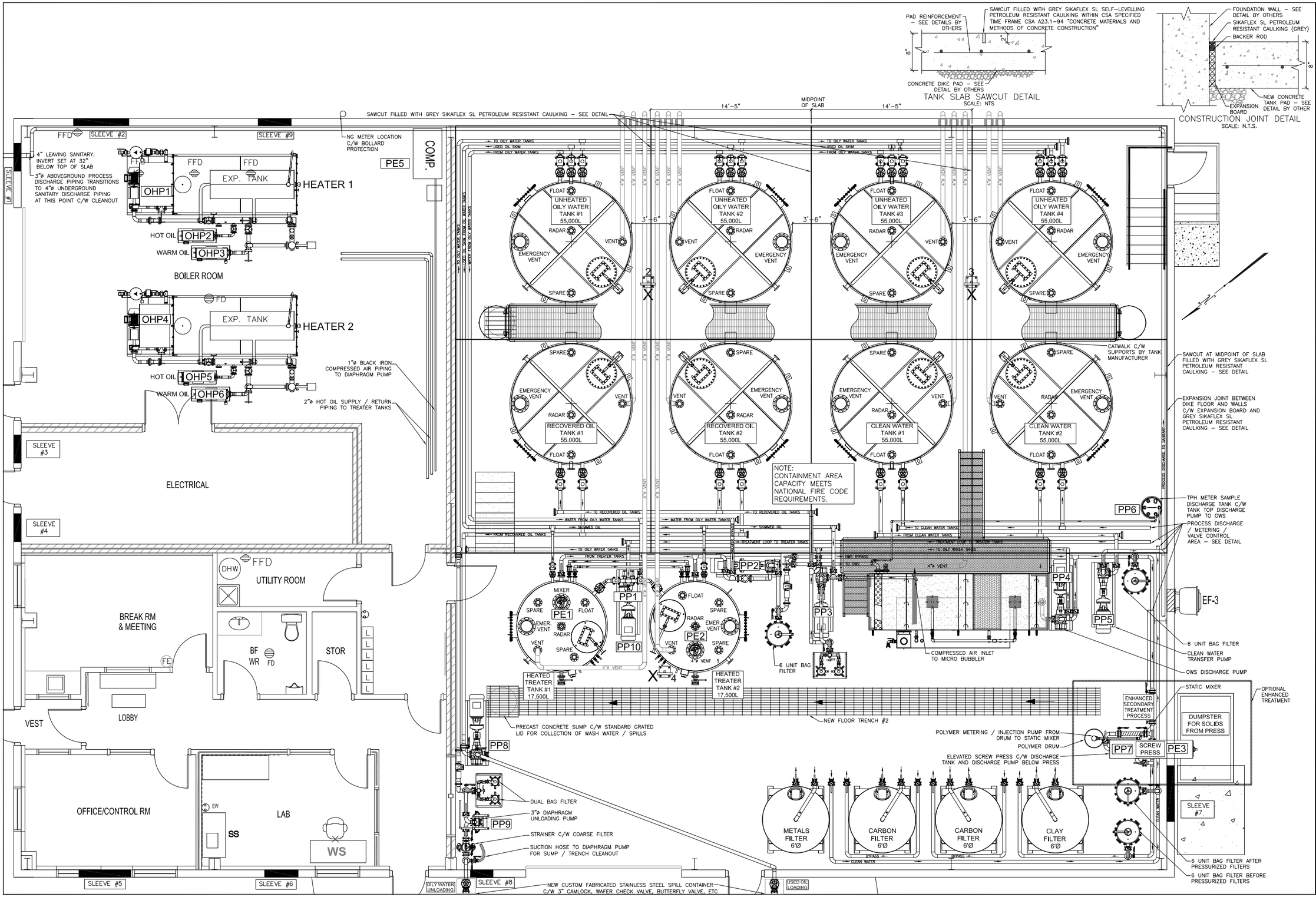
DATE: MAR 30, 2021

SCALE: 3/8" = 1'–0"

REV.: △

PROJECT NUMBER: GTS–1645

SHEET No. 2



PAD REINFORCEMENT – SEE DETAILS BY OTHERS

SAWCUT FILLED WITH GREY SIKAFLEX SL SELF-LEVELLING PETROLEUM RESISTANT CAULKING WITHIN CSA SPECIFIED TIME FRAME CSA A23.1-94 "CONCRETE MATERIALS AND METHODS OF CONCRETE CONSTRUCTION"

8"

CONCRETE DIKE PAD – SEE DETAIL BY OTHERS

TANK SLAB SAWCUT DETAIL
SCALE: NTS

FOUNDATION WALL – SEE DETAIL BY OTHERS

SIKAFLEX SL PETROLEUM RESISTANT CAULKING (GREY)

BACKER ROD

8"

EXPANSION BOARD

NEW CONCRETE TANK PAD – SEE DETAIL BY OTHER

CONSTRUCTION JOINT DETAIL
SCALE: N.T.S.

ISSUE

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80mm SLUMP

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REVISIONS

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Client: ENVIROSOIL

Address: PLEASANT STREET DARTMOUTH, NS

Project: NEW WASTE OIL RECYCLING & WASTE WATER TREATMENT FACILITY

Title: WATER TREATMENT SYSTEM BUILDING – GENERAL ARRANGEMENT

GALLAGHER TECHNICAL SERVICES LIMITED
22 DOUGLAS DRIVE
QUISPAMSIS, NB
E2G 1Y3
PHONE: 506 849 4116
FAX: 506 847 1070

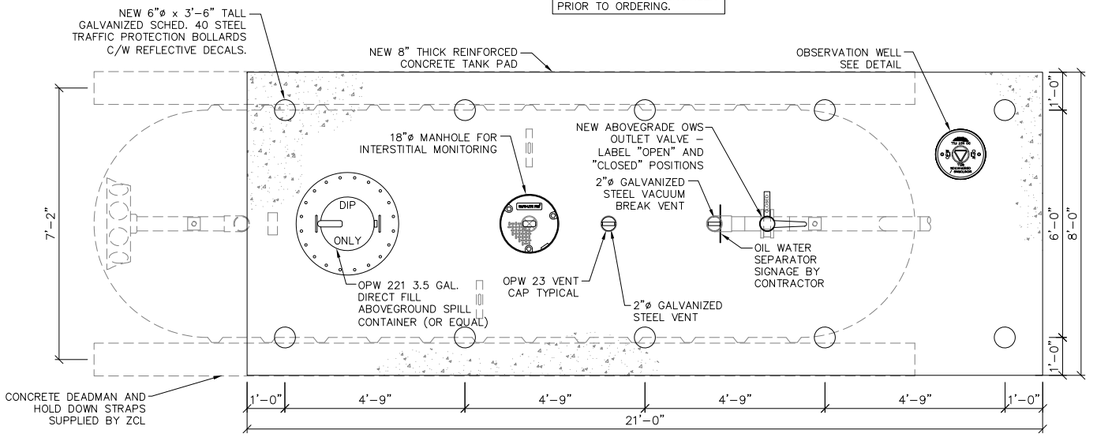
Stamp:

DESIGN:
DRAWN:
CHECKED:
DATE: MAR 30, 2021
SCALE: 1/4" = 1'–0"
REV.: △

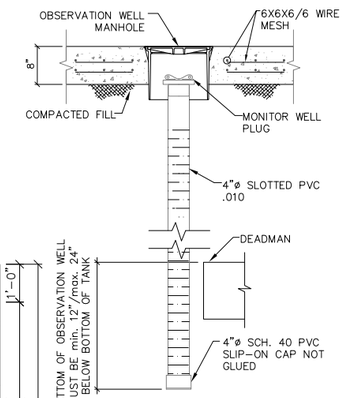
PROJECT NUMBER: GTS–1645

SHEET No. 3

NOTE:
CONTRACTOR TO SUBMIT OWS SHOP DRAWING TO ENGINEER PRIOR TO ORDERING.



TANK TOP CONCRETE - PLAN VIEW



OBSERVATION WELL - DETAIL
SCALE: NTS

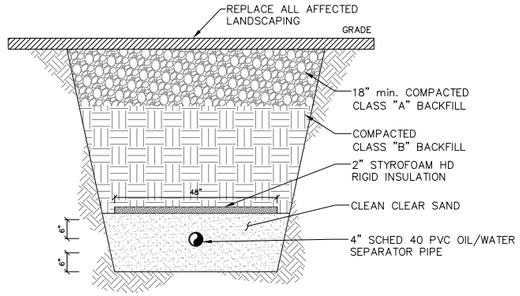
OBSERVATION WELL NOTES

1. (1) 4" DIA. PVC SLOTTED WELL SCREENS (MAX. SLOT .010") WILL BE INSTALLED AS REQUIRED BY LOCAL CODE. SLOTS WILL EXTEND TO WITHIN 24" BELOW GRADE.
2. EXTEND TANK NEST OBSERVATION WELL A MINIMUM OF 12" BELOW BOTTOM OF TANKS.
3. DO NOT PAINT INSIDE MANHOLE.
4. DO NOT GLUE REDUCERS, CAPS, OR COLLARS WITH PVC SOLVENT ADHESIVE.

NOTE:
EXCAVATION MUST BE SLOPED OR BENCHED TO WITHIN 4 ft OF THE BOTTOM OF THE EXCAVATION OR TRENCH WITH THE SLOPE OR BENCH NOT EXCEEDING 1 ft OF VERTICAL RISE TO EACH 1 ft OF HORIZONTAL RUN.

NOTE:
GEOTEXTILE TO FULLY LINE EXCAVATION, INCLUDING THE TOP OF THE TANKS ONCE 2 ft OF APPROVED BACKFILL HAS BEEN PLACED OVER TANK TOPS.

NOTE:
UNSTABLE SOILS AT BOTTOM OF EXCAVATION TO BE INSPECTED BY A GEOTECHNICAL ENGINEER FOR SUPERVISION AND INSTRUCTIONS TO ENSURE THE REQUIRED SOILS BEARING PRESSURE IS ACHIEVED.



PVC PIPE TRENCH DETAIL
SCALE: NTS

CLASS "A" GRAVEL	
SIEVE SIZE	PERCENT PASSING
1 1/2"	100
1 1/4"	95-100
3/4"	70-88
1/2"	55-78
3/8"	45-72
No. 4	30-57
No. 8	20-46
No.16	14-35
No.30	9-27
No.50	5-19
No.100	2-12
No.200	0-5

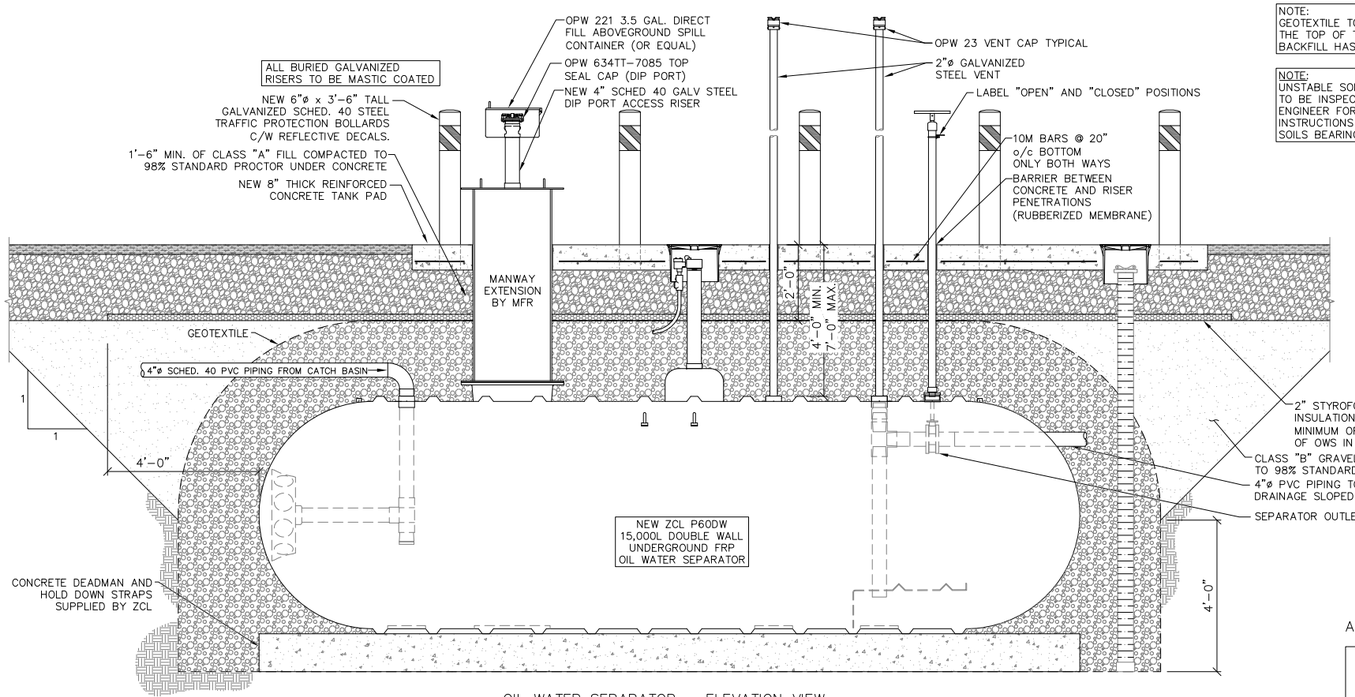
NOTE: CLASS "A" GRAVEL

CLASS "A" GRAVEL SHALL BE CRUSHED GRAVEL OR CRUSHED QUARRIED STONE OF HARD DURABLE PARTICLES FREE FROM SILT, CLAY, SLATE, FRIABLE PARTICLES, CEMENTATION, FROZEN MATERIAL, ORGANIC MATTER AND OTHER DELETERIOUS SUBSTANCES.

CLASS "B" GRAVEL	
SIEVE SIZE	PERCENT PASSING
5"	100
4"	95-100
3"	82-100
2"	62-100
1"	39-100
3/4"	30-94
3/8"	22-80
No. 4	16-66
No. 8	12-55
No.16	9-44
No.50	4-25
No.200	0-5

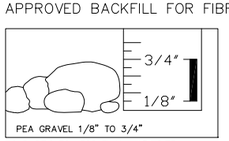
NOTE: CLASS "B" GRAVEL

FILL MATERIALS SHALL BE HARD, DURABLE PIT GRAVEL OR QUARRIED ROCK, FREE FROM SILT, CLAY, SLATE, FRIABLE PARTICLES, CEMENTATION, FROZEN MATERIAL, ORGANIC MATTER AND OTHER DELETERIOUS SUBSTANCES.

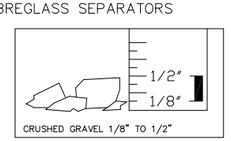


OIL WATER SEPARATOR - ELEVATION VIEW

APPROVED BACKFILL FOR FIBREGLASS SEPARATORS

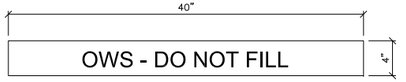


PEA GRAVEL 1/8" TO 3/4"



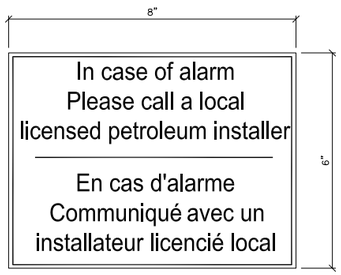
CRUSHED GRAVEL 1/8" TO 1/2"

NO PARTICLES LESS THAN 1/8" SIZE
SEE MANUFACTURES INSTRUCTIONS FOR ADDITIONAL DETAILS.



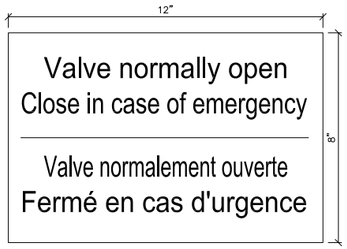
REQUIREMENTS:
MATERIAL: DECAL
SIZE: 40" X 4" (1016mm X 100mm)
COLOURS: BLACK TEXT ON SILVER BACKGROUND
INSTALLATION INSTRUCTIONS: INSTALL AT ALL OIL WATER SEPARATORS. LOCATE ON DIP PORT SPILL CONTAINER.

OWS DIP PORT DECAL
SCALE: NTS



REQUIREMENTS:
MATERIAL: ALUMINUM OR COREX
SIZE: 8" X 6" (200mm X 150mm)
COLOURS: BLACK TEXT ON SILVER BACKGROUND
INSTALLATION INSTRUCTIONS: INSTALL NEAR OWS ELECTRONIC MONITORING PANEL.

ELECTRONIC MONITORING PANEL SIGNAGE
SCALE: NTS



REQUIREMENTS:
MATERIAL: ALUMINUM OR COREX
SIZE: 12" X 8" (300mm X 200mm)
COLOURS: BLACK TEXT ON SILVER BACKGROUND
INSTALLATION INSTRUCTIONS: INSTALL NEAR EMERGENCY SHUT OFF VALVE OF OIL WATER SEPARATORS.

OWS EMERGENCY SHUT OFF VALVE SIGN
SCALE: NTS

ISSUE

FOR	BY	DATE
☐ - FOR REVIEW ONLY		
■ - FOR APPROVAL	TJG	MAR 30, 2021
☐ - FOR TENDER		
☐ - FOR CONSTRUCTION		
☐ - FOR AS BUILT		

NOTES:
- INSTALLER TO VERIFY LOCATION OF BUILDING AND PROPERTY LINES BEFORE BEGINNING WORK
- INSTALLER TO CHECK SITE FOR EXISTING SITE SERVICES SUCH AS: WATER AND SEWER LINES, ELECTRICAL LINES, ETC... PRIOR TO ANY EXCAVATION.
- ALL EQUIPMENT TO BE INSTALLED AND TESTED AS PER MANUFACTURES RECOMMENDATIONS
- INSTALLATION WORK TO BE COMPLETED IN ACCORDANCE WITH ALL APPLICABLE CODES.
- THIS PETROLEUM STORAGE SYSTEM CONFORMS TO ALL APPLICABLE ULC REQUIREMENTS AND STANDARDS INCLUDING ULC-S601, "SHOP FABRICATED STEEL ABOVEGROUND VERTICAL TANKS FOR PETROLEUM PRODUCTS," AND API 650 "WELDED STEEL TANKS FOR OIL STORAGE", LATEST EDITION.
- THIS DESIGN HAS ADDRESSED THE ISSUE OF POSSIBLE COLLECTION OF FLAMMABLE VAPOUR AND/OR LIQUID IN UNDERGROUND SUMPS.
- ALL WORK TO BE COMPLETED BY A PETROLEUM INSTALLER LICENSED BY THE PROVINCE OF NOVA SCOTIA.
- CONTRACTOR SHALL VERIFY ALL DIMENSIONS PRIOR TO COMMENCING WORK.
- ALL TANKS TO BE INSTALLED LEVEL

CONCRETE SPEC:
32MPa
5%-8% AIR
400MPa REBAR YIELD STRENGTH
80mm SLUMP

PRELIMINARY

No.	DESCRIPTION	BY	DATE

REVISIONS

Logo: envirosoil ISO 14001 · ISO 9001

Client: ENVIROSOIL

Address: PLEASANT STREET DARTMOUTH, NS

Project: NEW WASTE OIL RECYCLING & WASTE WATER TREATMENT FACILITY

Title: UNDERGROUND OIL WATER SEPARATOR DETAILS

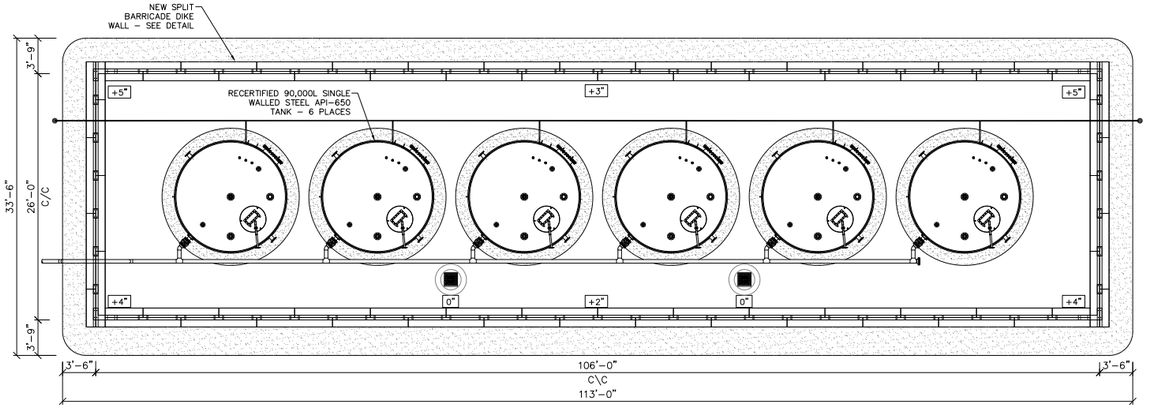
GALLAGHER TECHNICAL SERVICES LIMITED
22 DOUGLAS DRIVE
QUISPAMSIS, NB
E2G 1Y3
PHONE: 506 849 4116
FAX: 506 847 1070

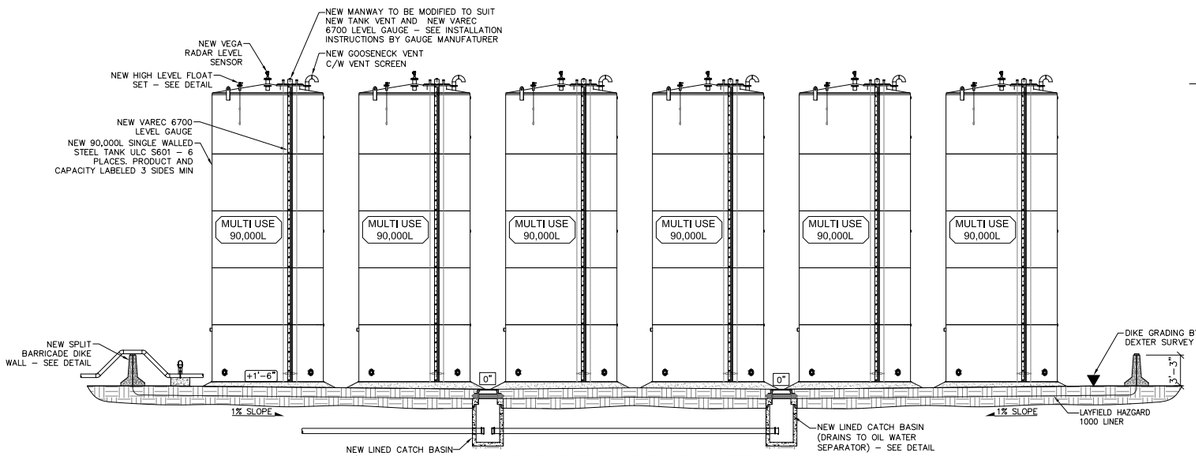
Stamp:

DESIGN:
DRAWN:
CHECKED:
DATE: MAR 30, 2021
SCALE: 1/2" = 1'
REV.: 0

PROJECT NUMBER: GTS-1645

SHEET No. 4





TANK FARM – ELEVATION VIEW

GENERAL NOTES:

1. GROUND RESISTANCE SHALL BE LESS THAN 10 OHMS MEASURED IN DRY CONDITIONS.
2. IF THIS VALUE CANNOT BE OBTAINED, ADD ANOTHER GROUNDING ROD 6.2m AWAY.
3. IF WATER OR SEWER PIPES ARE NEARBY, IT WILL BE NECESSARY TO GROUND THEM TO THE SYSTEM.
4. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LOCAL AND CANADIAN ELECTRICAL CODES.
5. BURY GROUND CONDUCTORS 300mm BELOW GRADE, TYPICAL OR AS NOTED. (ABOVE LINER INSIDE OF DYKE)
6. GROUND CONDUCTORS SHALL BE RUN CONTINUOUS THROUGH CONNECTIONS TO EQUIPMENT. DO NOT CUT AT CONNECTIONS. SPLICES WHERE ABSOLUTELY REQUIRED SHALL BE BURNDY SERVIT KS-23
7. COMPRESSION SPLICE BURNDY YS-L.
8. USE MANUFACTURERS RECOMMENDED COMPRESSION DIES WITH EACH CONNECTOR. ALL SURFACES OF CONNECTORS AND FITTINGS TO BE COATED WITH PENTROX COMPOUND.
9. ALL GROUNDING AND BONDING COPPER WIRES SHALL BE BURIED TO A MINIMUM OF 300mm. PROTECTION OF THE WIRES SHALL BE PROVIDED FROM THE BOTTOM OF TRENCHES TO ABOVE BALLAST AT TRACK SIDES AND WITHIN 150mm WHERE THEY RISE ABOVE GRADE LEVEL. FLEXIBLE SLEEVES SHALL BE PROVIDED TO THIS EFFECT TO AVOID ANY DAMAGE TO THE COPPER WIRES.
10. COPPER WIRE ELECTRICAL RESISTANCE:
    No.4 AWG, 0.8153 ohm/km
    No.6 AWG, 1.2966 ohm/km
11. "BURNDY" CATALOGUE NO. SHOWN FOR IDENTIFICATION ONLY. THERMOWELD, CALDWELD OR EQUAL CONNECTIONS MAY BE SUBSTITUTED ON NEW INSTALLATIONS.

NOTES

EXCAVATION AND FILL REQUIREMENTS

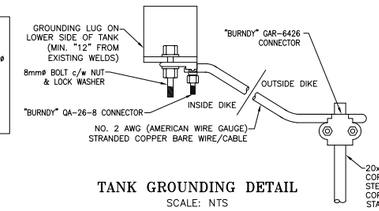
1. EXCAVATE TO THE REQUIRED LINES, LEVELS AND GRADES. DO NOT EXCAVATE OR DISTURB BEYOND THE REQUIRED LINES, LEVELS OR GRADES UNLESS REQUIRED BY THE ENGINEER.
2. WHERE THE REQUIRED LINES, LEVELS AND GRADES ARE NOT DEFINED, EXCAVATE AS NECESSARY FOR THE ITEMS WHICH ARE TO BE PLACED IN THE EXCAVATION.
3. DO NOT PLACE FILL UNTIL SUBGRADE HAS BEEN COMPACTED TO 95% OF MAX. DRY DENSITY BY MOD. PROCTOR.
4. DO NOT COVER ANY SUBGRADE OR WORK UNTIL AUTHORIZED BY THE ENGINEER,BUT OTHERWISE PLACE THE FILL AS SOON AS POSSIBLE.
5. REMOVE ALL DISTURBED MATERIAL AND ALL MATERIAL WHICH HAS BECOME UNSTABLE DUE TO INADEQUATE PROTECTION, DEWATERING AND/OR ANY OTHER REASON. REPLACE SUCH MATERIAL WITH GRANULAR "B" OR SUITABLE MATERIAL AS APPROVED BY THE ENGINEER IN 250mm LIFTS AND COMPACTED TO 95% OF MAX. DRY DENSITY BY MODIFIED PROCTOR.

LINER DETAILS

1. WHERE PIPES GO THROUGH THE DYKE, THE PERFORATION OF THE LINER MUST BE MADE BY USE OF THE SLEEVE SUPPLIED AS PART OF THE LINER.
2. THE LINER SHALL BE SEALED TO THE SUMP BASIN LOCATED AT THE LOW POINT OF THE TANK FARM FLOOR
3. GRANULAR 'A' TO BE COMPACTED TO 100% BY MOD. PROCTOR.
4. EARTH DYKE AND SUB- BASE TO BE COMPACTED IN 150mm LIFTS, USING MECHANICAL EQUIPMENT, TO 100% STANDARD PROCTOR DRY DENSITY.
5. SLOPE LINER FROM CORNERS OF DYKE WALL TO SUMP.

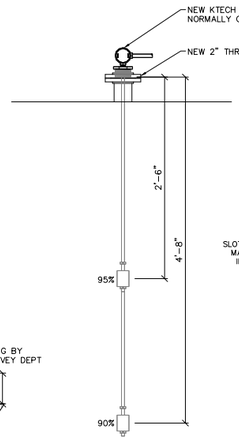
NOTES:

1. WHEN TANK TO GROUND RESISTANCE IS GREATER THAN 10 OHMS, USE 2 GROUND RODS ON OPPOSITE SIDES FOR TANKS OF 30.5m ø OR LESS. IF MORE THAN 30.5m ø USE 3 GROUND RODS.
2. WHEN SAND-BLASTING A TANK, MAKE SURE THE SANDER AND SURFACE TO BE SANDED ARE BONDED TOGETHER.
3. RUN ALL GROUND WIRE BENEATH TANK FARM FLOOR SURFACE (GRAVEL OR CONCRETE), BUT ABOVE LINER.
4. DO NOT INSTALL GROUND ROD INSIDE DYKE AREA



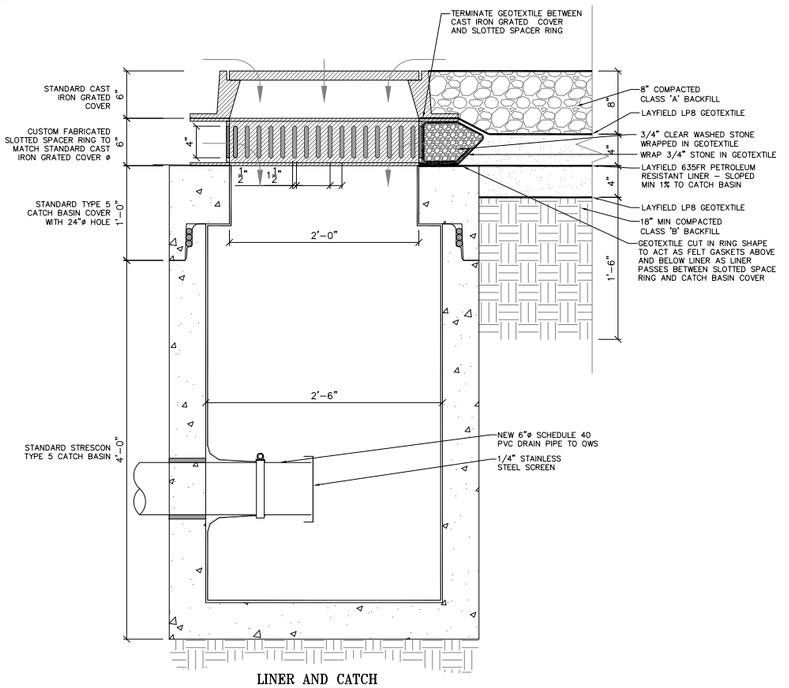
TANK GROUNDING DETAIL

SCALE: NTS



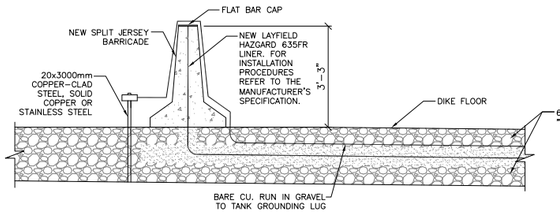
HIGH LEVEL FLOAT SWITCH – DETAIL

SCALE: NTS



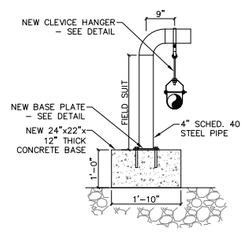
LINER AND CATCH BASIN DETAIL

SCALE: NTS



DIKE WALL DETAIL

SCALE: NTS



PIPE SUPPORT DETAIL

SCALE: NTS

CLASS "A" GRAVEL	
SIEVE SIZE	PERCENT PASSING
1 1/2"	100
1 1/4"	95–100
3/4"	70–88
1/2"	55–78
3/8"	45–72
No. 4	30–57
No. 8	20–46
No.16	14–35
No.30	9–27
No.50	5–19
No.100	2–12
No.200	0–5

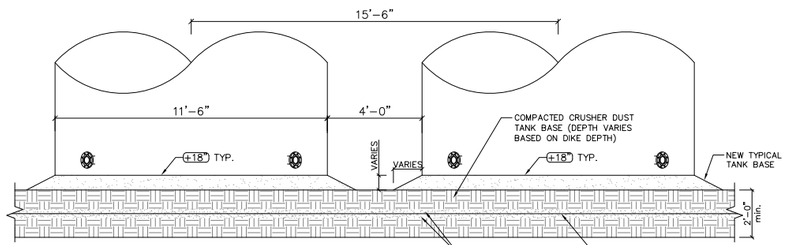
NOTE: CLASS "A" GRAVEL

CLASS "A" GRAVEL SHALL BE CRUSHED GRAVEL OR CRUSHED QUARRIED STONE OF HARD DURABLE PARTICLES FREE FROM SILT, CLAY, SLATE, FRIABLE PARTICLES, CEMENTATION, FROZEN MATERIAL, ORGANIC MATTER AND OTHER DELETERIOUS SUBSTANCES.

CLASS "B" GRAVEL	
SIEVE SIZE	PERCENT PASSING
5"	100
4"	95–100
3"	82–100
2"	62–100
1"	39–100
3/4"	30–94
3/8"	22–80
No. 4	16–66
No. 8	12–55
No.16	9–44
No.50	4–25
No.200	0–5

NOTE: CLASS "B" GRAVEL

FILL MATERIALS SHALL BE HARD, DURABLE PIT GRAVEL OR QUARRIED ROCK, FREE FROM SILT, CLAY, SLATE, FRIABLE PARTICLES, CEMENTATION, FROZEN MATERIAL, ORGANIC MATTER AND OTHER DELETERIOUS SUBSTANCES.



TYPICAL TANK BASE DETAIL

SCALE: NTS

NOTE:
ELEVATIONS SHOWN ARE RELATIVE TO EACH OTHER ONLY AND ARE NOT INTENDED TO RELATE TO ANY OTHER ELEVATIONS THROUGH THE DRAWING SET

NOTE:
THE THICKNESS OF CRUSHER DUST BACKFILL UNDER THE TANKS INCREASES AS GROUND SLOPES DOWN TOWARDS CATCH BASIN (TO KEEP TANK BOTTOM ELEVATIONS EQUAL).

NOTE:
BONDING CONNECTIONS SHALL BE ELECTRICALLY AND MECHANICALLY FIRM. JACKS, PLUGS, CLAMPS AND CONNECTING POINTS SHALL BE CLEAN UNPAINTED METAL TO PROVIDE POSITIVE ELECTRICAL CONNECTION.

DIKE CAPACITY CALCULATION:

–NFC REQUIRES A DIKE BE ABLE TO HOLD 100% OF THE LARGEST TANK + 10% OF EACH ADDITIONAL TANK.

VOLUME REQUIRED = 100% OF LARGEST TANK + 10% OF EACH ADDITIONAL TANK
= 90,000L + 7(9,000L)
= 90,000L + 63,000L
= 153,000L (5,404 ft³)

–CONSERVATIVELY, REMOVE FOOTPRINT OF ALL TANKS FROM TOTAL DIKE AREA, LEAVING THE FOLLOWING AVAILABLE CONTAINMENT AREA:

AVAILABLE AREA = 1960FT²

–WALL HEIGHT REQUIRED:

5,404 ft³ = 1960FT² X H
H = 2.76 ft

ADD 6" FREEBOARD = WALL HEIGHT TO BE 39"

GEOTECHNICAL INSTRUCTIONS:

EXCAVATE TO 600mm (2') BELOW THE UNDERSIDE OF THE TANK FARM ELEVATIONS. THE EXPOSED SUBGRADE SURFACE SHALL THEN BE PROOF ROLLED WITH A LARGE STEEL DRUM ROLLER AND INSPECTED AND APPROVED BY THE ENGINEER. ANY SOFT AREAS SHALL BE SUBEXCAVATED AND REPLACED WITH GRANULAR "B" MATERIAL (SEE BELOW).

THE SUBBASE SHALL CONSIST OF 450mm (1.5') GRANULAR "B" PLACED IN TWO LIFTS.

THE BASE SHALL CONSIST OF 150mm (6") OF GRANULAR "A" MATERIAL AND ELEVATED CRUSHER DUST TANK PADS.

ALL GRANULAR MATERIALS TO BE COMPACTED TO 100% OF THE STANDARD PROCTOR
MAXIMUM DRY DENSITY USING SUITABLE VIBRATORY COMPACTION EQUIPMENT. COMPACTION TESTING WILL BE PROVIDED BY THE ENGINEER (PROVIDE 3 DAYS NOTICE).

ISSUE

	FOR	BY	DATE
☐	– FOR REVIEW ONLY		
■	– FOR APPROVAL	TJG	MAR 30, 2021
☐	– FOR TENDER		
☐	– FOR CONSTRUCTION		
☐	– FOR AS BUILT		

NOTES:

- INSTALLER TO VERIFY LOCATION OF BUILDING AND PROPERTY LINES BEFORE BEGINNING WORK
- INSTALLER TO CHECK SITE FOR EXISTING SITE SERVICES SUCH AS: WATER AND SEWER LINES, ELECTRICAL LINES, ETC... PRIOR TO ANY EXCAVATION.
- ALL EQUIPMENT TO BE INSTALLED AND TESTED AS PER MANUFACTURES RECOMMENDATIONS
- INSTALLATION WORK TO BE COMPLETED IN ACCORDANCE WITH ALL APPLICABLE CODES.
- THIS PETROLEUM STORAGE SYSTEM CONFORMS TO ALL APPLICABLE ULC REQUIREMENTS AND STANDARDS INCLUDING ULC-S601, "SHOP FABRICATED STEEL ABOVEGROUND VERTICAL TANKS FOR PETROLEUM PRODUCTS," AND API 650 "WELDED STEEL TANKS FOR OIL STORAGE", LATEST EDITION.
- THIS DESIGN HAS ADDRESSED THE ISSUE OF POSSIBLE COLLECTION OF FLAMMABLE VAPOUR AND/OR LIQUID IN UNDERGROUND SUMPS.
- ALL WORK TO BE COMPLETED BY A PETROLEUM INSTALLER LICENSED BY THE PROVINCE OF NOVA SCOTIA.
- CONTRACTOR SHALL VERIFY ALL DIMENSIONS PRIOR TO COMMENCING WORK.
- ALL TANKS TO BE INSTALLED LEVEL

CONCRETE SPEC:

32MPa
5%-8% AIR
400MPa REBAR YIELD STRENGTH
80mm SLUMP

No.	DESCRIPTION	BY	DATE

REVISIONS

Logo: envirosoil ISO 14001 • ISO 9001

Client: ENVIROSOIL

Address: PLEASANT STREET
DARTMOUTH, NS

Project: NEW WASTE OIL RECYCLING & WASTE WATER TREATMENT FACILITY

Title: EXTERIOR USED OIL STORAGE DIKE

GALLAGHER TECHNICAL SERVICES LIMITED
22 DOUGLAS DRIVE
QUISPAMSIS, NB
E2G 1Y3
PHONE: 506 849 4116
FAX: 506 847 1070

Stamp:

DESIGN:
DRAWN:
CHECKED:
DATE: MAR 30, 2021
SCALE: 1/8" = 1'-0"
REV.: △

PROJECT NUMBER: GTS-1645

SHEET No. 5

Appendix B

Equipment Technical Sheets

U. S. Department of Homeland Security
United States Coast Guard
Certificate of Approval

Coast Guard Approval Number: 162.050/9018/1 Expires: 13 March 2017

OIL POLLUTION PREVENTION EQUIPMENT
The following device has been tested in accordance
with IMO Resolution MEPC.107 (49)

Turner Designs Hydrocarbon Instruments, Inc.
2023 North Gateway Boulevard
Suite 101
Fresno CA 93727-1623

TD-4100; 15 ppm Bilge Alarm

This is to certify that the bilge alarm listed has been examined and tested in accordance with the requirements of the specifications contained in IMO Resolution MEPC.107(49).

Equipment manufactured by Turner Designs Hydrocarbon Instruments, Inc. to general arrangement drawings located within the TD-4100 Design, Installation, & Operations Guide, Revision 1, dated December 21, 2004.

A copy of this certificate should be carried aboard a vessel fitted with this equipment at all times.

IMO Certificates of Type Approval do not expire and are valid for equipment manufactured at any time during the period of validity of this certificate.

Test data and results attached in the appendix.

This certificate documents compliance with 46 CFR 162.050.

*** END ***

THIS IS TO CERTIFY THAT the above named manufacturer has submitted to the undersigned satisfactory evidence that the item specified herein complies with the applicable laws and regulations as outlined on the reverse side of this Certificate, and approval is hereby given. This approval shall be in effect until the expiration date hereon unless sooner canceled or suspended by proper authority.

GIVEN UNDER MY HAND THIS 13th DAY OF MARCH 2012, AT WASHINGTON D.C.

S. J. KELLY
Chief, Engineering Division
U.S. Coast Guard Marine Safety Center

DEPT. OF HOMELAND SECURITY, USCG, CGHQ-10030
(REV. 3-03)

TERMS: The approval of the item described on the face of the Certificate has been based upon the submittal of satisfactory evidence that the item complies with the applicable provisions of the navigation and shipping laws and the applicable regulations in Title 33 and/or Title 46 of the Code of Federal Regulations. The approval is subject to any conditions noted on this Certificate and in the applicable laws and regulations governing the use of the item on vessels subject to Coast Guard inspection or on other vessels and boats.

Consideration will be given to an extension of this approval provided application is made 3 months prior to the expiration date of this Certificate.

The approval holder is responsible for making sure that the required inspections or tests of materials or devices covered by this approval are carried out during production as prescribed in the applicable regulations.

The approval of the item covered by this certificate is valid only so long as the item is manufactured in conformance with the details of the approved drawings, specifications, or other data referred to. No modification in the approved design, construction, or materials is to be adopted until the modification has been presented for consideration by the Commandant and confirmation received that the proposed alteration is acceptable.

NOTICE: Where a manufacturer of safety-at-sea equipment is offering for sale to the maritime industry, directly or indirectly, equipment represented to be approved, which fails to conform with either the design details or material specifications, or both, as approved by the Coast Guard, immediate action may be taken to invoke the various penalties and sanctions provided by law including prosecution under 46 U.S.C. 3318, which provides:

"A person that knowingly manufactures, sells, offers for sale, or possesses with intent to sell, any equipment subject to this part *(Part B. of Subtitle II of Title 46 U.S.C.)*, and the equipment is so defective as to be insufficient to accomplish the purpose for which it is intended, shall be fined not more than $10,000, imprisoned for not more than 5 years or both."

APPENDIX

United States Coast Guard Certificate of Approval
Coast Guard Approval Number: 162.050/9018/1
Expires: 13 March 2017

TEST DATA AND RESULTS OF TESTS CONDUCTED ON A 15 PPM BILGE ALARM IN ACCORDANCE WITH THE GUIDELINES AND SPECIFICATIONS CONTAINED IN IMO RESOLUTION MEPC.107(49)

15 ppm Bilge Alarm submitted by:

Turner Designs Hydrocarbon Instruments, Inc.

Test location:

Testing Engineers International, Inc.
Testing Services-Plumbing Laboratory
4121 South 500 West
Salt Lake City, UT 84123-1399

Method of sample analysis:

ISO 9377-2-2000(E)

Samples analyzed by:

Director, Tei-Testing Services-Analytical Laboratory

Environmental testing of the electrical and electronic sections of the 15 ppm Bilge Alarm has been carried out in accordance with the guidelines and specifications contained in IMO resolution MEPC.107(49). The equipment functioned satisfactorily on completion of each test specified on the environmental test protocol.

Calibration Test and Response Time Test

	"A"		"B"		"C"	
	Measured	Grab	Measured	Grab	Measured	Grab
0 ppm	0.0	< 0.5	0.0	< 0.5	0.0	< 0.5
15 ppm	15.0	15.7	15.2	17.3	14.4	18.1
Full Scale	29.3	28.1	30.4	33.7	31.2	34.5
Water Temperature	25 - 27.5°C		25 - 27.8°C		24 – 26.8°C	
Re-zero	No		No		No	
Recalibrate	No		No		No	
Response Time (seconds)	1.2		0.9		1.3	

Contamination and Color Test

	Oil Content Meter Reading
Clean Water and Test Fluid "B" at 10 ppm	9.7 ppm
Very Salt Water and Test Fluid "B" at 10 ppm	9.3 ppm
Iron Oxide at 10 ppm	9.7 ppm
Iron Oxide at 50 ppm	9.6 ppm
Iron Oxide at 100 ppm	9.7 ppm

Sample Pressure or Flow Test

15 ppm Bilge Alarm reading shift at 50% of normal	14.7 ppm
15 ppm Bilge Alarm reading shift at 200% of normal	14.2 ppm
Deviations:	No deviations to the test method were made.

APPENDIX

United States Coast Guard Certificate of Approval
Coast Guard Approval Number: 162.050/9018/1
Expires: 13 March 2017

TEST DATA AND RESULTS OF TESTS CONDUCTED ON A 15 PPM BILGE ALARM IN ACCORDANCE WITH THE GUIDELINES AND SPECIFICATIONS CONTAINED IN IMO RESOLUTION MEPC.107(49)

Shut Off Test

15 ppm Bilge Alarm reading before shut off	15.6 ppm
15 ppm Bilge Alarm reading after shut off	15.1 ppm
Damage to 15 ppm Bilge Alarm:	No damage was caused by this test to the 15 ppm Bilge Alarm.

Utilities Supply Variation Test

110% Voltage Effects	There was no change in the Bilge Alarm reading.
90% Voltage Effects	There was no change in the Bilge Alarm reading.
110% Air Pressure Effects	There was no change in the Bilge Alarm reading.
90% Air Pressure Effects	There was no change in the Bilge Alarm reading.
110% Hydraulic Pressure Effects	There was no change in the Bilge Alarm reading.
90% Hydraulic Pressure Effects	There was no change in the Bilge Alarm reading.

Calibration and Zero Drift Test

Calibration Drift	0.1 ppm
Zero Drift	0.0 ppm

Diagram of test rig attached.
Diagram of sampling arrangement attached.

*** END ***

SOLITAX®sc TURBIDITY & SUSPENDED SOLIDS SENSORS

Applications

- Drinking Water
- Wastewater
- Beverage
- Industrial Water
- Power

PROGNOSYS™ READY

Accurate, color-independent suspended solids and turbidity measurements.

Greater Accuracy, Less Maintenance

Hach Solitax sc sensors provide accurate, color-independent measurement of turbidity and suspended solids in drinking water, wastewater and industrial process applications. A self-cleaning device prevents biological growth and interference of gas bubbles. This system's reliable performance and full data communication capability help improve process control and reduce treatment costs associated with polymer use, digester volume, and sludge handling.

Excellent Correlation to Laboratory Analysis

Solitax sc sensors show an exceptional correlation to laboratory analysis. On-line measurement not only saves time on manual analysis, but also provides critical real-time measurements that can be used to operate the plant more efficiently.

Fully Serviceable Sensors

Conventional turbidity and suspended solids sensors are potted and are discarded when they no longer function. Solitax sc sensors are fully serviceable, which often doubles the useful life of the sensor.

Easy One-point Calibration

Factory calibrated in conformity with DIN EN ISO 7027 for long-term calibration stability. Calibration is easy with a simple correction factor procedure.

Multi-channel, Multi-parameter System

Any two Solitax sc sensors can be installed on one Hach SC200 Controller. The same controller can also accommodate any combination of parameters. All of Hach's model sc sensors are "plug and play" with no complicated wiring or set-up procedure necessary.

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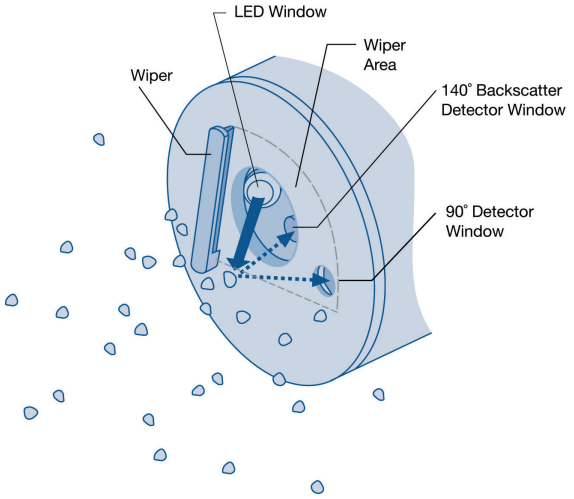
Specifications*

	For insertion in pipes		For immersion in open tanks		
Model	INSERTION inline sc	INSERTION highline sc	IMMERSION t-line sc	IMMERSION ts-line sc	IMMERSION hs-line sc
Parameter	Suspended Solids, Turbidity	Hight Range Suspended Solids, Turbidity	Turbidity	Suspended Solids, Turbidity	Hight Range Suspended Solids, Turbidity
Measuring Range Turbidity	0.001 to 4000 NTU	0.001 to 4000 NTU	0.001 to 4000 NTU	0.001 to 4000 NTU	0.001 to 4000 NTU
Measuring Range TSS-Content	0.001 mg/L to 50 g/L	0.001 mg/L to 500 g/L		0.001 mg/L to 50 g/L	0.001 mg/L to 500 g/L
Unit	Turbidity: User selectable—NTU, FNU, or TE/F Suspended Solids: User selectable—g/L, mg/L, ppm, or % solids				
Accuracy	Turbidity up to 1000 NTU; without calibration < 5% of the measured value ±0.01 NTU; with calibration < 1% of the measured value ±0.01 NTU				
Repeatability	Suspended solids content: < 3 %				
	Turbidity: < 1 %				
Response Time	1 s < T90 < 300 s (adjustable)				
Calibration Method	Turbidity: Formazin or Stablcal Standard (at 800 NTU). Suspended Solids: Sample specific, based on gravimetric TSS analysis with a correction factor procedure.				
Certifications	CE certified to EN 61326-1, EN 61326/A1, EN 61326/A2, EN 61010-1				
Flow	Max. 3 m/s (the presence of air bubbles affects the measurement)				
Operating Temperature Range	0 to 40 °C (32 to 104°F)				
Pressure Limit	Stainless steel: 6 bar or 60 m (87 psi) PVC: 1 bar or 10 m (14.5 psi) Stainless steel: 6 bar or 60 m (87 psi) PVC: 1 bar or 10 m (14.5 psi)				
Material	Optics Carrier and Sleeve: stainless steel 1.4571 or black PVC Wiper Arm: stainless steel 1.4581; Wiper Blade: silicone (standard) Optional: Viton (LZX578); Wiper Shaft: stainless steel 1.4571 Threaded cable fitting: stainless steel 1.4305 or white PVC		Optics Carrier and Sleeve: stainless steel 1.4571 or black PVC Wiper Arm: stainless steel 1.4581; Wiper Blade: silicone (standard) Optional: Viton (LZX578); Wiper Shaft: stainless steel 1.4571 Threaded cable fitting: stainless steel 1.4305 or white PVC	
Weight Sensor	Insertion stainless steel: 2.4 kg (5.29 lb.)		Immersion stainless steel: 1.38 kg (3.0 lb.) Immersion PVC: 0.52 kg (1.2 lb.)		
Cable Length	10 m (optional extension cables available)				
					*Subject to change without notice

Principle of Operation

Solitax sc ts-line sensor with dual-beam optics and added backscatter detector

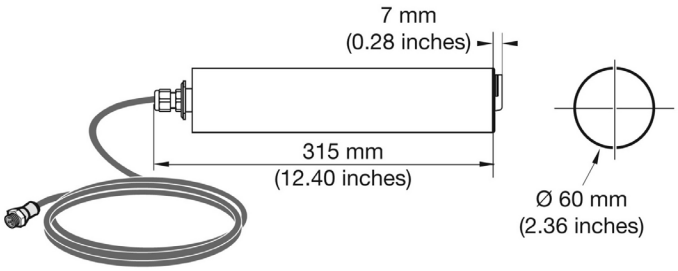
- Dual infrared light beams. LED light source transmits light at 45° to sensor face.
- Nephelometric photoreceptors detect light at 90° to the transmitted light beam.
- Backscatter photoreceptor (included on all models except the Solitax sc t-line) detects light at 140° to the transmitted light beam to measure suspended solids in heavily loaded sample streams.
- Self-cleaning wiper, optional.
- T-line probes measure turbidity only. TS, HS, inline, and highline sensors measure either turbidity or suspended solids.



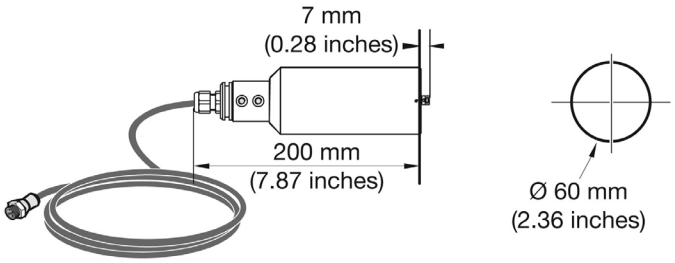
Dimensions

Hach Solitax sc sensors can be fixed to the rim of the tank for immersion applications or inserted directly through the sidewall of a pipeline for insertion applications. A variety of installation kits are available.

Solitax sc Insertion Probe

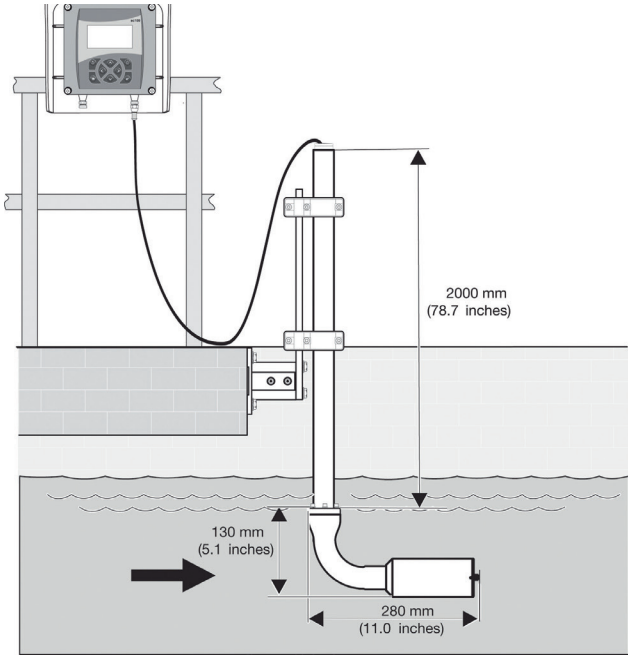


Solitax sc Immersion Probe

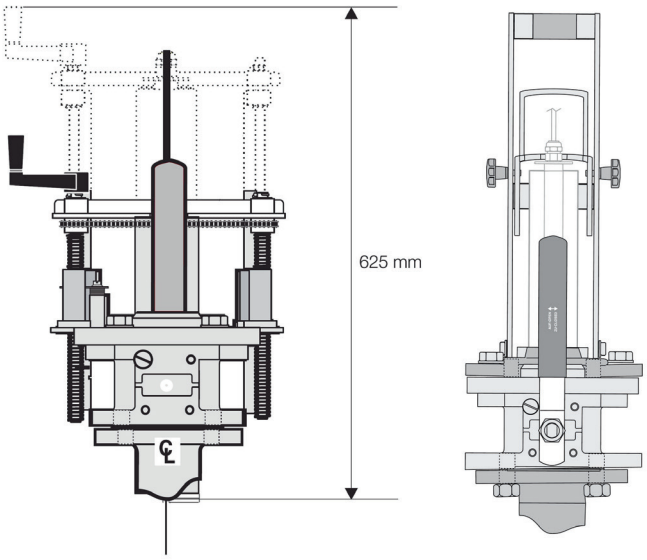


Installation / Mounting

Installation for mounting Solitax sc for immersion in open tanks. (Stainless steel pole mount kit, Prod. No. LZY714.99.53120)



Fixture with ball valve for mounting Solitax sc models inline and highline sensors in pipes., minimum pipe size 100 mm (4-in.) (Prod. No. LZX337, max pressure 6 bar; Prod. No. 936, max. pressure 1 bar.



Ordering Information

Common Configurations: Solitax sc Turbidity and Suspended Solids Analyzers with SC200 controller and sensors shown

Immersion in Open Tanks Applications

2983400 Turbidity Analyzer, t-line sc, PVC, with wiper (0.001 to 4000 NTU)

2983500 Turbidity and Suspended Solids Analyzer, ts-line sc, stainless steel with wiper (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L)

2983600 Turbidity and High Range Suspended Solids Analyzer, hs-line sc, stainless steel with wiper (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L)

Insertion in Pipes Applications (includes insertion mounting kit)

2983700 Turbidity and Suspended Solids Analyzer, inline sc, stainless steel with wiper (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L)

2983900 Turbidity and High Range Suspended Solids Analyzer, highline sc, stainless steel with wiper (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L)

NOTE:
1. Power cords must be ordered separately.
2. Fixed point installation kit or handrail mount kit must be ordered separately for all immersion analyzers.

Individual Solitax sc Sensors

Immersion Sensors

LXV423.99.10000 Turbidity, t-line sc, PVC with wiper (0.001 to 4000 NTU)

LXV423.99.12000 Turbidity, t-line sc, PVC without wiper (0.001 to 4000 NTU)

LXV423.99.10100 Turbidity and Suspended Solids, ts-line sc, PVC with wiper (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L)

LXV423.99.12100 Turbidity and Suspended Solids, ts-line sc, PVC without wiper (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L)

LXV423.99.00100 Turbidity and Suspended Solids, ts-line sc, stainless steel with wiper (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L)

LXV423.99.02100 Turbidity and Suspended Solids, ts-line sc, stainless steel without wiper (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L)

LXV423.99.10200 Turbidity and Suspended Solids, hs-line sc, PVC with wiper (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L)

LXV423.99.12200 Turbidity and Suspended Solids, hs-line sc, PVC without wiper (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L)

LXV423.99.00200 Turbidity and Suspended Solids, hs-line sc, stainless steel with wiper (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L)

LXV423.99.02200 Turbidity and Suspended Solids, hs-line sc, stainless steel without wiper (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L)

Insertion Sensors

LXV424.99.00100 Turbidity and Suspended Solids, inline sc, stainless steel with wiper (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L)

LXV424.99.02100 Turbidity and Suspended Solids, inline sc, stainless steel without wiper (0.001 to 4000 NTU, 0.001 mg/L to 50 g/L)

LXV424.99.00200 Turbidity and Suspended Solids, highline sc, stainless steel with wiper (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L)

LXV424.99.02200 Turbidity and Suspended Solids, highline sc, stainless steel without wiper (0.001 to 4000 NTU, 0.001 mg/L to 500 g/L)

Installation Accessories

LZY714.99.53120 Stainless Steel pole mount kit for Solitax t-line, ts-line, and hs-line immersion sensors, including 10 cm base and 2 m pole with sensor adapter

5738400 Insertion Mounting Kit for inline and highline insertion sensors (ball valve safety armature and extraction system). Kit includes a 4 inch pre-coped Carbon Steel Flange. Non-coped flanges are available

AHA033NPT Sensor Adapter, straight 1-1/2 FNPT

AHA034NPT Sensor Adapter, elbow 1-1/2 FNPT 90°

MH236B00Z Handrail Mounting Kit (for sensor to be used with either adapter above) includes 1.5-inch diameter by 7.5-ft long CPVC pipe and swivel/pivot/ pipe clamp assembly

LZX337 Stainless steel ball valve safety armature/ extraction fitting for in-line and hi-line probes w/o welding flange, maximum operating pressure 6 bar/87 psi

LZX936 Stainless steel ball valve armature, maximum operation pressure 1 bar/14.5 psi

LZX660 Non-coped stainless steel welding flange for insertion kit

LZX661 Non-coped carbon steel welding flange for insertion kit

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Outside United States: 970-669-3050 tel 970-461-3939 fax int@hach.com
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OPTIMIZE YOUR RESULTS. PROTECT OUR ENVIRONMENT.

ONLINE PECOD® ANALYZER
REAL TIME COD, BOD, AND TOC

REAL USER BENEFITS

Green chemistry with no hazardous reagents protects operators and the environment

Save time and money through process optimization

Full autonomous control, operators simply set sampling frequency and press START

INNOVATIVE TECHNIQUE

The patented PeCOD® technology provides a unique nanotechnology-based photoelectochemical technique for determining bulk oxidizability of a sample stream

The strong oxidation power of the Titanium Dioxide photosensor facilitates rapid oxidation of all reactive organic matter, providing results in just 10 minutes!

Online PeCOD Specifications

COD Method	Photocatalytic TiO_2 Oxidation
Measuring Range	0.7 – 15,000 mg/L
Auto-Dilution Capability	Extends range >200,000 mg/L
Time of Analysis	10 – 15 minutes
User Control	Fully Automated via Software
Calibration and QC	Automatic Timed Intervals
Method Precision	≤ ± 5%
Compatible Matrices	Water, Wastewater, Process
Waste Disposal	Non-Hazardous, Drain/Carboy
Organizer Options	Cabinet or Rolling Cart
System Dimensions (Cabinet)	20 X 42 X 60 IN 50 X 107 X 153 CM
Enclosure Material	Corrosion-Resistant Steel
Operating Temperature	5 to 40°C
Power Requirements	Standard 100 – 240V AC Outlet
Parameter Add-Ons	pH, EC, Alkalinity and more
Additional Capabilities	Manual/Portable Operation
	4-20mA for SCADA Control
	Multi-Stream Analysis
	Real-Time Alerts

For more information and pricing, contact us at:

519-763-4245

info@mantech-inc.com

MANTECH

DR 6000™ UV-VIS SPECTROPHOTOMETER

Applications

- Beverage
- Drinking Water
- Industrial Water
- Pharmaceutical
- Power
- Wastewater

The industry's most advanced lab spectrophotometer.

With UV and Visible Spectrum capabilities, over 250 pre-programmed methods including the most common testing methods used, guided procedures, and integrated quality assurance software, the DR 6000 ensures you are ready to handle your comprehensive water testing needs.

Your Water Testing Needs, All in One Spectrophotometer

The DR 6000 has the most pre-programmed testing methods, including high-speed wavelength scanning across the UV and Visible Spectrum.

Accessories for High Volume and High Accuracy Testing Needs

A carousel sample changer allows up to seven sequential measurements. The Sipper Module, an instrument-controlled sample delivery system, increases precision by constant optical characteristics.

Advanced Quality Assurance at Your Fingertips

The DR 6000 comes with integrated QA software for scheduling, documenting and interpreting all of your needed quality measurements.

Guided Procedures and Elimination of False Readings

The DR 6000, when used with TNTplus® reagent vials, provides the accurate results you need by guiding you step-by-step through your testing procedures. With TNTplus, the instrument averages 10 readings and eliminates outliers, making scratched, flawed or dirty glassware a non-issue.

Automatically Avoids Errors

RFID* technology automatically updates the program calibration factors when you place a TNTplus reagent box near the DR 6000. The instrument identifies chemistry expiration dates via a barcode on the vials, and detects chemistry coefficient factors to avoid errors that can occur in lot-to-lot variations in the chemistry.

**RFID technology currently available only in US, Anguilla, American Samoa, Australia, Bolivia, Canada, Cayman Islands, Columbia, Dominican Republic, El Salvador, Federated States of Micronesia, Guam, Guatemala, Marshall Islands, New Zealand, Northern Mariana Islands, Palau, Panama, Puerto Rico, and US Virgin Islands.*

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Specifications*

Operating Mode	Transmittance (%), absorbance and concentration (wavelength, time)
Source Lamp	Tungsten (visible range), deuterium (UV range)
Wavelength Range	190 - 1100 nm
Wavelength Accuracy	± 1 nm
Wavelength Reproducibility	< 0.1 nm nm
Wavelength Resolution	0.1 nm
Wavelength Selection	Automatic, based on method selection
Spectral Bandwidth	2 nm
Scanning Speed	900 nm/min (in 1 nm steps)
Photometric Measuring Range	± 3 Abs
Photometric Accuracy	5 mAbs at 0.0-0.5 Abs
	<1% at 0.5-2.0 Abs at 546 nm
Photometric Linearity	0.005 - 2 Abs
	≤ 0.01 at > 2 Abs with neutral glass at 546 nm
Stray Light	KI-solution at 220 nm < 3.3 Abs/ < 0.05%

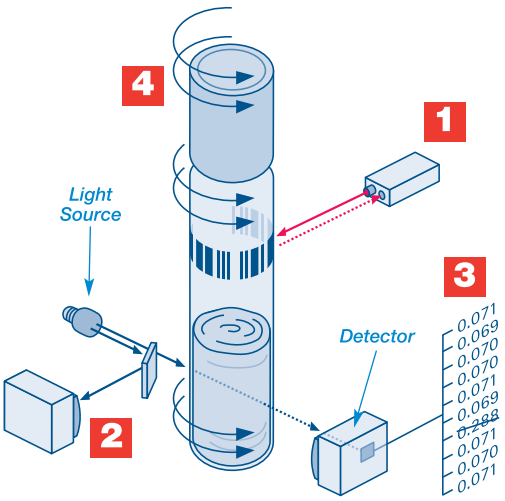
Display	TFT 7 inch WVGA color touch
Data Logger	5000 data points (result, date, time, sample-ID, user-ID)
Preprogrammed Methods	> 250
User Programs	200
Sample Cell Compatibility	Rectangular: 10, 20, 30, 50 mm, 1 inch; round: 13 mm, 16 mm, 1 inch
	Optional 100 mm rectangular cell with additional adapter
Dimensions (H x W x D)	8.5 in x 19.7 in x 18.1 in (215 mm x 500 mm x 460 mm)
Weight	24.25 lbs. (11 kg)
Operating Conditions	10 at 40 °C, max. 80% relative humidity (non-condensing)
Storage Conditions	-25 to 60 °C max. 80% relative humidity (non-condensing)
Enclosure Rating	IP20 with closed lid
Interfaces	USB type A (2), USB type B, Ethernet, RFID module
Warranty	1 year

**Subject to change without notice.*

Principle of Operation

Hach's TNTplus chemistries and spectrophotometers are made to work seamlessly with each other.

- *Many of the tests are EPA compliant.*
- *Over 35 tests available including these popular EPA Approved Parameters:*
  - *Ammonia*
  - *COD*
  - *Chlorine*
  - *Chromium*
  - *Iron*
  - *Nitrate*
  - *Nitrite*
  - *Nitrogen*
  - *Phosphorus*
  - *Sulfate*



How TNTplus Works

1 Barcode Recognition
Simply drop in the vial and get results immediately with automatic method detection.

2 Reference Detector
Monitors and compensates for optical fluctuations.

3 10X Measurement and Outlier Elimination
Dirty, scratched, or flawed glassware, including fingerprints, is no longer an issue—instrument averages 10 readings and rejects outliers.

4 Self-Contained Packaging—Reagents Inside Sealed Cap
Reduces exposure to chemicals—no need to open pillows or clean glassware.

See our TNTplus video at: www.hach.com/tntplus

Available Tests

The following table lists available tests and overall ranges for the Hach DR 6000 Benchtop Spectrophotometer. The ranges may represent more than one available test for the instrument. Consult your Hach representative, Customer Service, the Hach Master Catalog, or the Hach web site at www.hach.com for complete details of all available tests for this instrument.

Parameter	Range	TNTplus Test
Alachlor	0.1 to 0.5 ppb, threshold	
Alkalinity, Total	25 to 400 mg/L	•
Aluminum	0.002 to 0.800 mg/L	•
Ammonia, Nitrogen	0.015 to 50.0 mg/L	•
Arsenic	0.020 to 0.200 mg/L	
Atrazine	0.5 to 3.0 ppb, threshold	
Barium	2 to 100 mg/L	
Benzotriazole	1.0 to 16.0 mg/L	
Boron	0.2 to 14.0 mg/L	
Bromine	0.05 to 4.50 mg/L	
Cadmium	.7 µg/L to 0.30 mg/L	•
Carbohydrazide	5 to 600 µg/L	
Chloramine, Mono	0.04 to 10.0 mg/L	
Chloride	0.1 to 25.0 mg/L	
Chlorine Dioxide	0.01 to 1000 mg/L	
Chlorine, Free	0.02 to 10.0 mg/L	•
Chlorine, Total	2 µg/L to 10.0 mg/L	•
Chromium, Hexavalent	0.010 to 1.00 mg/L	•
Chromium, Total	0.01 to 0.70 mg/L	•
Cobalt	0.01 to 2.00 mg/L	
Color	3 to 500 units	
COD (Chemical Oxygen Demand)	0.7 to 15,000 mg/L	•
Copper	1 µg/L to 8.0 mg/L	•
Cyanide	0.002 to 0.240 mg/L	
Cyanuric Acd	5 to 50 mg/L	
DEHA (Diethylhydroxylamine)	3 to 450 µg/L	
Dissolved Oxygen	6 µg/L to 40 mg/L	
Erythorbic Acid (Isoascorbic acid)	13 to 1500 µg/L	
Fluoride	0.02 to 2.00 mg/L	
Formaldehyde	3 to 500 µg/L	
Hardness, Total (Calcium and Magnesium as $CaCO_3$)	4 µg/L to 4.00 mg/L	
Hydrazine	4 to 600 µg/L	
Hydroquinone	9 to 1000 µg/L	
Iodine	0.07 to 7.00 mg/L	
Iron, Ferrous	0.02 to 3.00 mg/L	
Iron, Total	0.009 to 6.0 mg/L	•

Parameter	Range	TNTplus Test
Lead	3 µg/L to 2.0 mg/L	•
Manganese	0.006 to 20.0 mg/L	
Mercury	0.1 to 2.5 µg/L	
Methylethylketoxime (MEKO)	15 to 1000 µg/L	
Molybdenum, Molybdate	0.02 to 40.0 mg/L	
Nickel	0.006 to 6.0 mg/L	•
Nitrate, Nitrogen	0.01 to 35 mg/L	•
Nitrite, Nitrogen	0.002 to 250 mg/L	•
Nitrogen, Simplified Total Kjeldahl	0 to 16 mg/L	•
Nitrogen, Total	0.5 to 150 mg/L	•
Nitrogen, Total Inorganic	0.2 to 25.0 mg/L	
Nitrogen, Total Kjeldahl	1 to 150 mg/L	
Ozone	0.01 to 1.50 mg/L	
PCB (Polychlorinated Biphenyls)	1 to 50 ppm, threshold	
Phenols	0.002 to 0.200 mg/L	
Phosphonates	0.02 to 125.0 mg/L	
Phosphorus, Acid Hydrolyzable	0.06 to 100.0 mg/L	
Phosphorus, Reactive (Orthophosphate)	19 µg/L to 100.0 mg/L	•
Phosphorus, Total	0.06 to 100.0 mg/L	•
Potassium	0.1 to 7.0 mg/L	
Quaternary Ammonium Compounds	0.2 to 5.0 mg/L	
Selenium	0.01 to 1.00 mg/L	
Silica	3 µg/L to 100 mg/L	
Silver	0.005 to 0.700 mg/L	
Sulfate	2 to 900 mg/L	•
Sulfide	5 to 800 µg/L	
Surfactants, Anionic	0.002 to 0.275 mg/L	
Suspended Solids	5 to 750 mg/L	
Tannin and Lignin	0.1 to 9.0 mg/L	
TOC (Total Organic Carbon)	0.3 to 700 mg/L	
Tolyltriazole	1.0 to 20.0 mg/L	
Toxicity	0 to 100% Inhibition	
TTHM (Trihalomethanes, Total)	10 to 600 µg/L	
TPH (Total Petroleum Hydrocarbons)	2 to 200 ppm, threshold	
Volatile Acids	27 to 2800 mg/L	•
Zinc	0.01 to 3.00 mg/L	

Ordering Information

DR 6000 UV VIS Spectrophotometer includes a multi adapter for round and rectangular vials, basic user manual, CD with manual and procedure manual in PDF format. Power cords for US and EU. RFID version available only in a limited number of countries, including US, Australia, Bolivia, Canada, Guatemala, and New Zealand. For complete information, visit hach.com or contact your sales representative.

LPV441.99.00012 DR 6000™ UV VIS Spectrophotometer with RFID Technology

LPV441.99.00002 DR 6000™ UV VIS Spectrophotometer without RFID

Accessories

LQV157.99.20002 SIP 10, sipper set for Pour-Thru methods, 1 inch vial

LQV156.99.10012 LOC 100: Kit for Radio Frequency ID (RFID) based sample tracking

LZV902.99.00002 Carousel Holder 7x1 cm

LZV902.99.00012 Carousel Holder 5x1 inch

LZV943 Application Software Enzymatic Food Analysis

LZV942 Application Software Brewery Analysis

LZV941 Application Software Drinking Water Analysis

Service Options

BSPPLUSDR6000 Bench Service Plus Partnership

The Bench Service Plus Partnership includes repairs at the Hach Service Center, one on-site start-up or preventative maintenance/calibration visit, unlimited technical support calls, and free software upgrades.

BSPDR6000 Bench Service Partnership

The Bench Service Partnership includes repairs and one annual preventative maintenance/calibration service per year at the Hach Service Center, unlimited technical support calls, and free software upgrades.

HACH COMPANY World Headquarters: Loveland, Colorado USA

United States: 800-227-4224 tel 970-669-2932 fax orders@hach.com
Outside United States: 970-669-3050 tel 970-461-3939 fax int@hach.com
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Appendix C

Surface Water Management Plan

December 2, 2021

Envirosoil Limited
927 Rocky Lake Drive
Bedford, NS
B4A 3Z2
jscott@dexter.ca

Attention: Jerry Scott, M.Eng., P.Eng.
General Manager

Surface Water Management Plan, Proposed Waste Oil Recycling and Water Treatment Facility, 750 Pleasant Street, Dartmouth, Nova Scotia

Dillon Consulting Limited (Dillon) is pleased to present Envirosoil Limited (Envirosoil) with the following response to Items 2)a.i through 2)a.iii. from Nova Scotia Environment and Climate Change's Request for Additional Information to the Environmental Assessment Registration Document dated April 2021 for the proposed Waste Oil Recycling and Water Treatment Facility, located in Dartmouth, Nova Scotia. Specifically, the responses provided aim to satisfy the request for additional Surface Water Management information.

Project Background

Envirosoil proposes to construct and operate a Waste Oil Recycling and Water Treatment Facility at 750 Pleasant Street in Dartmouth, NS. The proposed undertaking is on a previously disturbed industrial site, where the majority of the property is currently being used as an operating liquid asphalt receiving, storage and transfer facility. The waste oil recycling and water treatment components of this project will be sited on Parcel Identification Number (PID) 00260703. Access to the main facility from the Pleasant Street entrance will cross General Liquids Canada property (PID 41464280), as well as PID 00643238 which is owned by Canadian National Railway and serves as an active railway corridor.

The project will consist of installation of six (6) multi-use tanks, to be located near the northeast boundary of the property, as well as associated water treatment equipment located within the existing building on site.

Background Data Collection and Review

Available background information was reviewed to support the documents attached to this report. These data included previous reports and regulatory submissions, topographic and geographic information, climate and meteorological data including

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potential future climate change projections, geological information, and a review of applicable municipal, provincial, and federal regulations.

It is important to note that the Surface Water Management Plan (dated September 2020) for the site at 750 Pleasant Street included the impervious area associated with the new proposed installation of the six (6) multi-use tanks and associated containment area, and there are no changes expected to the drainage volumes or patterns on site related to this proposed development. In 2020, prior to development of the site for the use as a liquid asphalt storage and transfer facility, to quantify and mitigate potential increases in site runoff, an assessment of runoff conditions was completed for both pre- and post-development conditions at the site. This assessment report, including modelling results, is in Appendix D.

Request for Additional Information Items

Item 2)a.i: Stormwater Management System Features

The area of the site is approximately 1.2 ha. Stormwater on the existing site is managed with site grading, perimeter berms, and a stone-filled infiltration trench system (French drain), collecting at a First-Defense® stormwater separator prior to being released to the Halifax Harbour. Site stormwater management system features are summarized in Table 1, with additional details on the orientation and sizing of the existing surface water management system, and the associated discharge point which are included in Appendix A.

Table 1: Stormwater Management System Features Summary

Feature	Design Capacity	Connection(s)	Discharge Point
Petroleum-Resistant Secondary Containment Dyke	110% volume of largest tank or 100% of largest tank +10% of aggregate capacity of all other tanks (whichever is greater)	OWS Piping	Oil Water Separator (OWS)
Double-Walled FRP Oil Water Separator (OWS)	15,000 L	40 PVC OWS Drain Pipe	Stormwater Sewer (Halifax Water)
Earthen Perimeter Berm (existing)	Approx. 0.15m high	French Drain (existing)	French Drain (existing)
French Drain (existing)	166 m^3 of volumetric runoff storage	Perforated Piping (existing)	First-Defence® FD-6HC (existing)
First-Defence® FD-6HC stormwater separator (existing)	Peak Flow: 906 L/s Min. Sediment Storage: 1.2 m^3 Oil Storage Capacity: 1878 L	Outlet (existing)	Halifax Harbour

Item 2)a.ii: Stormwater Collection and Management

The footprint of the six (6) multi-use tanks and associated containment area was considered in the Surface Water Management Plan for the original 2020 development of the site. Therefore, installation of this new external infrastructure is not expected to alter existing drainage patterns on the property.

Design of the new tank system is such that water collected within its containment dyke will be directed to a 15,000L oil-water separator prior to release to the Halifax Water municipal stormwater sewer. The OWS is a standard commercial product design that is commonly used in the HRM to treat precipitation collected in containment structures, prior to discharge to the stormwater sewer system. As such, post-development runoff conditions are not expected to change compared to existing conditions.

Post-development site runoff is not expected to have an impact on the receiving body (Halifax Harbour) nor cause adverse stormwater effects to adjacent properties. Runoff is contained on-site, including all loading and unloading areas, by an existing earthen perimeter berm and ditching. Site grading and ditching directs runoff from all areas, including loading and unloading, towards the French drain (consisting of a stone-filled infiltration trench and perforated pipe) to promote infiltration and intercept and remove suspended solids (TSS) from runoff. A First-Defense® FD-6HC stormwater separator is installed downstream of the perforated pipe to allow for separation of oils and hydrocarbons, coarse particles, fine particles, and trash and floatables prior to discharge, if required.

Item 2)a.iii: Surface Water Management and Monitoring

The stormwater collected at the project site is to be monitored for both quality and quantity. A surface water sampling plan focusing on metered readings for temperature, pH, turbidity and conductivity and water sampling for TSS will be undertaken on a monthly basis, consistent with the current operational monitoring at the site. Additional monitoring during storm events can be undertaken, if necessary. The complete proposed monitoring plan is consistent with recommendations provided in the main EARD submission and is attached in Appendix B.

Erosion and Sedimentation Control Plan

An Erosion and Sediment Control Plan (ESCP) has been developed for the construction and operational phases at the project site to mitigate erosion as much as possible, and to incorporate sediment control where needed. Recommended adaptable ESC measures are outlined in the ESCP attached in Appendix C, and include ditches, silt

fencing, and other control measures as deemed appropriate. Upon project completion, grading on site is not expected to change from existing conditions.

Additional Item: Stormwater Release to Marine Environment

Post-development site runoff is not expected to change from existing conditions. Site grading and ditching directs runoff from all areas, including loading and unloading, towards the French drain (consisting of a stone-filled infiltration trench and perforated pipe) to promote infiltration and intercept and remove suspended solids (TSS) from runoff. A First-Defense® FD-6HC stormwater separator is installed downstream of the perforated pipe to allow for separation of oils and hydrocarbons, coarse particles, fine particles, and trash and floatables prior to discharge, if required. Post-development site runoff is not expected to have an impact on the receiving body (Halifax Harbour).

Reporting

The reporting required for this project, as outlined in Appendix B, will provide updates to plans and engineered drawings of containment features and environmental controls. This will inform the ongoing monitoring and maintenance of stormwater features and erosion and sedimentation control measures as the site is developed.

Closing

We trust this letter and associated appendices meet your requirements. We are available for further discussion at your convenience.

Sincerely,

DILLON CONSULTING LIMITED

Paul Koke, M.A., CISEC
Project Manager

PK:lmk
Attachments

Appendix A

Hydrologic and Hydraulic Assessment

SURFACE WATER MANAGEMENT PLAN

Hydrologic and Hydraulic Assessment

The proposed development consists of the construction and operation of a Waste Oil Recycling and Water Treatment Facility, located at 750 Pleasant Street, Dartmouth. The site has an area of approximately 12,039 m^2. The runoff from the study site discharges into the Halifax Harbour.

Item 1: Description of Stormwater Infrastructure Associated With Flows from the Site

No changes to site runoff are expected post -development. Existing runoff from the site is currently directed to a stone-filled trench along the southern boundary of the property, which is shown in Figure A-1. A perforated 200 mm pipe (i.e., French drain) is installed in the trench, which connects to a manhole and First-Defense® stormwater separator that discharges through a 200 mm pipe to the Halifax Harbour. An earthen berm with a crest elevation of 8.59 m exists on the southern side of the site to direct runoff into the trench.

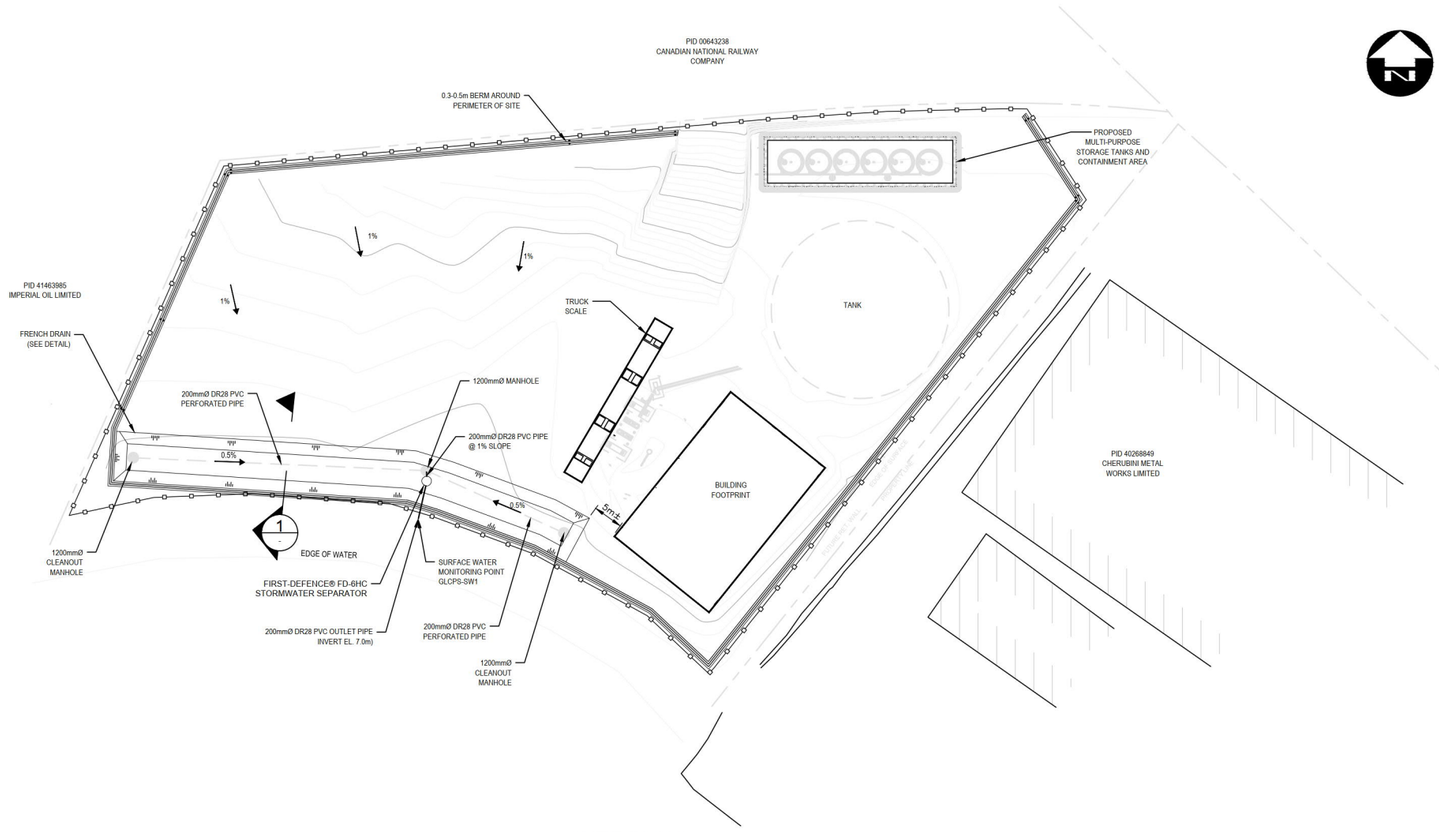
Item 2: Recommended Plans for Monitoring, Maintenance, and Upgrading of Stormwater Infrastructure

It is recommended that stormwater associated with the area of the six (6) proposed multi-use tanks and associated containment area be managed on-site with a petroleum-resistance secondary containment dyke and an oil-water separator prior to release to the municipal stormwater sewer (Halifax Water).

The existing site is generally graded at approximately 1% towards the Harbour. Runoff that flows towards the edge of the property is intercepted by the perimeter berm, which is approximately 0.15 m high and is intended to keep runoff on-site. Maintaining runoff on-site is intended to mitigate total suspended solids (TSS) migration into the harbour. The elevation of the berm has been built to limit excessive ponding on site to mitigate flooding of adjacent site facilities.

The French drain on site promotes infiltration of stormwater and removal of suspended solids. During operations, a 200-mm perforated pipe collects stormwater and promotes infiltration into the stone layer surrounding the pipe. The French drain then leads to a First-Defense® FD-6HC stormwater separator that outlets to the Harbour in overflow conditions.

Details of the design, orientation and sizing of the secondary containment dyke and the 15,000 L oil-water separator, and identification of the associated discharge point, including maintenance recommendations, are included in Figure A-1.



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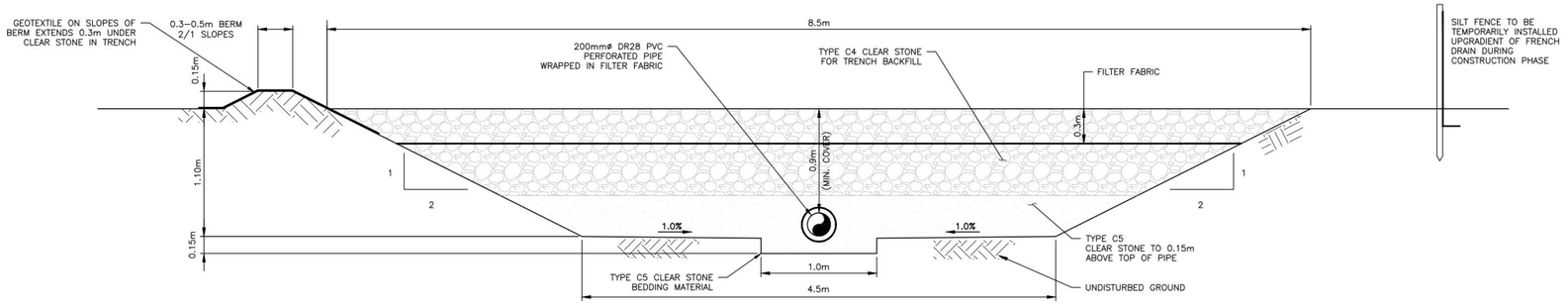

1 FRENCH DRAIN WITH PIPE TRENCH DETAIL
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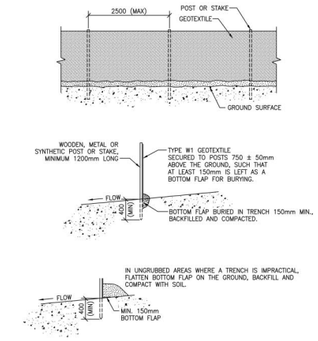

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NOTE:
THE CONTRACTOR SHALL PROVIDE ADEQUATE SILTATION AND EROSION PROTECTION OF ALL DRAINAGE COURSES AS ESTABLISHED BY THE EROSION AND SEDIMENTATION CONTROL HANDBOOK FOR CONSTRUCTION SITES AS PREPARED BY NOVA SCOTIA ENVIRONMENT.

GENERAL NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS SPECIFIED OTHERWISE.
2. REGULAR MONITORING AND MAINTENANCE OF STORMWATER INFRASTRUCTURE TO BE PERFORMED AS REQUIRED. SEDIMENT REMOVAL SHALL BE PERFORMED SO AS TO CAUSE MINIMAL DISTURBANCE TO THE GROUND OR ANY PART OF THE FRENCH DRAIN OR STORMWATER SEPARATOR.
3. INSPECTION AND MAINTENANCE OF THE STORMWATER SEPARATOR AND OUTFALL SHALL BE PERFORMED QUARTERLY TO CONFIRM PERFORMANCE. INSPECTION FREQUENCY TO BE RE-ASSESSED AT THE ANNUAL REPORTING PERIOD.
4. BACKFILL AND COMPACTION METHODOLOGY AND MATERIALS TO BE CONFIRMED AND APPROVED IN THE FIELD BY GEO-TECHNICAL ENGINEER, IF REQUIRED.
5. CONTRACTOR RESPONSIBLE FOR COORDINATING FIELD LOCATES AND CLEARANCE CERTIFICATES FROM APPROPRIATE UTILITIES PRIOR TO COMMENCING CONSTRUCTION.
6. ALL WORK TO BE PERFORMED IN ACCORDANCE WITH EXISTING NSE APPROVALS.
7. EARTHWORKS, MANHOLES AND PIPEWORK TO BE IN ACCORDANCE WITH THE STANDARD SPECIFICATION FOR MUNICIPAL SERVICES, LATEST EDITION.

WATER QUALITY MONITORING NOTES

1. ALL MONITORING TO BE COMPLETED IN ACCORDANCE WITH THE MORE STRINGENT OF: PROJECT SPECIFIC ENVIRONMENTAL PERMIT, OR APPLICABLE PROVINCIAL/FEDERAL GUIDELINES.
2. GLCPS-SW2 TO BE SAMPLED FROM A REPRESENTATIVE BACKGROUND LOCATION OFF-SITE.
3. IF SAMPLING OF THE ON-SITE SURFACE WATER INDICATES NON-COMPLIANCE WITH APPLICABLE PROVINCIAL AND FEDERAL GUIDELINES THIS MAY REQUIRE THE IMPLEMENTATION OF SUPPLEMENTAL CHEMICAL/MECHANICAL TREATMENT AND PUMPING (E.G. FLOC TANK).

SEDIMENT CONTROL PLAN NOTES

1. REGULAR MONITORING AND MAINTENANCE OF EROSION CONTROL WORKS TO BE PERFORMED AS REQUIRED. SEDIMENT REMOVAL SHALL BE PERFORMED SO AS TO CAUSE MINIMAL DISTURBANCE TO THE GROUND OR ANY PART OF THE EROSION CONTROL STRUCTURE.
2. GEOTEXTILE FENCING SHOULD BE POSITIONED TO KEEP SEDIMENT ON-SITE.
3. ANY EXPOSED SOILS TO REMAIN UNTOUCHED FOR GREATER THAN 14 DAYS MUST BE VEGETATED OR COVERED AS SOON AS POSSIBLE.
4. CONTRACTOR TO TAKE ALL REASONABLE PRECAUTIONS ON SITE TO LIMIT MIGRATION OF SEDIMENTS. THIS WILL INCLUDE MINIMIZING AREA OF DISTURBANCE AT ANY GIVEN TIME, COVERING DISTURBED SOILS, AND PROTECTION OF EXISTING STORM DRAIN INLETS.
5. SITE TO BE GRADED TOWARDS FRENCH DRAIN LEADING TO FIRST DEFENDER FD-6HC.

LEGEND

PROPOSED	EXISTING
PROPERTY BOUNDARY	
FENCING	
BERM	
PERIMETER DITCH	
SLOPE	
PERFORATED PIPE	
NON-PERFORATED PIPE	
MANHOLE	
STORMWATER SEPARATOR	

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REGISTERED PROFESSIONAL ENGINEER PROVINCE OF NOVA SCOTIA 10253 DATE Nov 20

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SURFACE WATER MANAGEMENT
PLEASANT STREET, DARTMOUTH, NS

SURFACE WATER MANAGEMENT PLAN AND DETAILS

PROJECT NO.: 19-1742

SHEET NO.: A-1

Appendix B

Surface Water Monitoring Program

SURFACE WATER MANAGEMENT PLAN

Surface Water Monitoring Program

To satisfy regulatory requirements, the following provides a surface water quality and quantity monitoring plan including proposed monitoring locations, monitoring parameters, and monitoring frequency.

Surface water context: There is no effluent discharge proposed directly to surface water. Surface water at the property related to runoff from precipitation and as part of site design is directed to a drainage feature to the east and south east of the property (see Appendix A). The drainage feature discharges above Ordinary High Water (OHW) to the Halifax Harbour. Current site operations include a French Drain, which limits the volume and frequency of discharge, and a First-Defense® FD-6HC stormwater separator to treat runoff prior to discharge. Discharge from the outfall is expected only during storm events of moderate intensity and duration.

The proposed surface water monitoring program consists of construction and operational phase monitoring. Construction monitoring will occur during periods of earthworks associated with the new external multi-use storage tanks and associated containment area. The operational surface water monitoring program proposed reflects an initial year of confirmatory monitoring and a reduction in sampling frequency in subsequent years if conditions are as predicted.

Sampling Locations

One primary downstream sampling location is proposed due to the configuration of the site. The proposed primary surface water sampling location (GLCPS-SW1) is located at the First Defender system, and the sample is proposed to be collected immediately prior to the discharge point to the Halifax Harbour, shown in Figure B-1. The topography of the property limits the potential for an upgradient sampling location. The majority of the surface water runoff anticipated at the property is from precipitation falling on the property. Surface water in samplable volume is not anticipated to enter the property from adjacent properties, based on observations of existing conditions at the site.

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GENERAL NOTES

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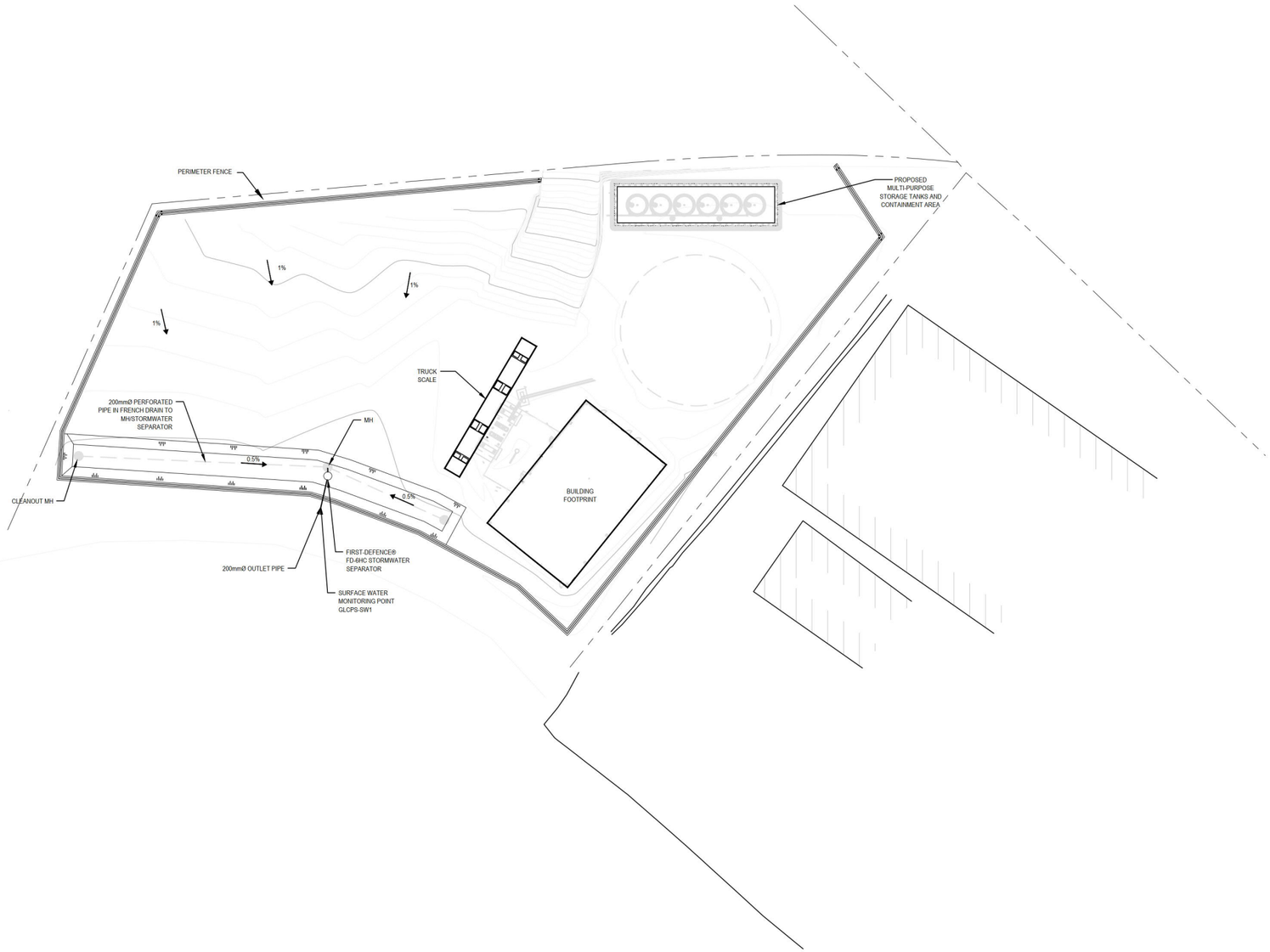
3. GLCPS-SW2 TO BE SAMPLED FROM A REPRESENTATIVE BACKGROUND LOCATION OFF-SITE.
4. IF SAMPLING OF THE ON-SITE SURFACE WATER INDICATES NON-COMPLIANCE WITH APPLICABLE PROVINCIAL AND FEDERAL GUIDELINES THIS MAY REQUIRE THE IMPLEMENTATION OF SUPPLEMENTAL CHEMICAL/MECHANICAL TREATMENT AND PUMPING (E.G. FLOC TANK).



SITE PLAN
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SURFACE WATER MANAGEMENT
PLEASANT STREET, DARTMOUTH, NS

SURFACE WATER MONITORING PLAN

PROJECT NO. 19-1742

SHEET NO. **B-1**

Sampling Methodology and Quality Assurance/Quality Control (QA/QC)

All surface water sampling will be conducted by personnel trained in environmental sampling, with appropriate qualifications, and following industry standard protocols. Samples to be submitted for laboratory analysis will be collected as grabs in laboratory-supplied bottles. Laboratory analysis will be performed at a facility accredited for the analysis undertaken (e.g., Canadian Association for Laboratory Accreditation (CALA) or Standards Council of Canada (SCC)). Some water quality parameters will be assessed using field instruments. Calibration of meters will be undertaken as per appropriate manufacturer's recommendations prior to the sampling event and field instrument use will be documented. Control (QA/QC) activities will include duplicate samples for laboratory analysis at a minimum of 10% of total samples.

Construction Phase Surface Water Monitoring Program

During the limited earthworks construction in the area of the installation of the six (6) new storage tanks and associated containment area, surface water monitoring will be undertaken in conjunction with the sedimentation and erosion control (ESC) program (see Appendix C). Sampling will be undertaken on a precipitation event basis. Sampling will focus on metered turbidity and pH measurements at identified sampling locations. Sampling will be initiated within one hour of a precipitation event of over 25mm or at the end of the day for each day of the storm event for precipitation events that last longer than one day. Following sampling, visual inspection of the ESC measures will be undertaken as noted in Appendix C.

Operational Surface Water Monitoring Program

Operational surface water sampling within property runoff will be folded into the existing Surface Water Management Program pending NSECC approval of the sampling program and once operations have been initiated. Surface water sampling consisting of metered readings for temperature, pH, turbidity and conductivity and water sampling for Total Suspended Solids (TSS) will be undertaken on a monthly basis. If at any time a hydrocarbon sheen is observed, samples will be collected for Total Petroleum Hydrocarbon/Benzene, Toluene, Ethylene, Xylene (TPH/BTEX).

As noted in Appendix A, inspection and maintenance of the oil-water separator, First-Defense® FD-6HC stormwater separator, and outfall shall be performed quarterly by Envirosoil to confirm performance. Inspection frequency is to be re-assessed at the time of the annual reporting period.

During each sampling event, rainfall occurring within the previous 24 hours and within the previous three days will be documented based on Environment and Climate Change Canada's nearest meteorological station (Shearwater RCS 8205092).

Regulatory Guidelines

Assessment of conditions will reflect NSECC Industrial Approval conditions and Canadian Council of the Ministers of the Environment (CCME) Fresh Water Aquatic Life (FWAL) guidance and observed background/upgradient conditions (i.e., existing/natural conditions may not meet CCME guidelines). Guidelines will include comparison of results with total suspended solids (TSS) guideline of:

- Clear flow - Maximum increase of 25 mg/L from background levels for any short-term exposure (e.g., 24-h period). Maximum average increase of 5 mg/L from background levels for longer term exposures (e.g., inputs lasting between 24 h and 30 d).
- High flow - Maximum increase of 25 mg/L from background levels at any time when background levels are between 25 and 250 mg/L. Should not increase more than 10% of background levels when background is ≥ 250 mg/L.

For turbidity measurement, results will be compared to the turbidity guideline of:

- Clear flow - Maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period).
- High flow or turbid waters - Maximum increase of 8 NTUs from background levels at any one time when background levels are between 8 and 80 NTUs. Should not increase more than 10% of background levels when background is > 80 NTUs.

Where approval requirements are not met, a description of action taken will be provided to NSECC within one week of the finding.

Reporting

Reporting for construction monitoring will occur within 24 hours of the sampling event if regulatory guidelines are exceeded. For the operational monitoring, an annual report is anticipated in conjunction with a groundwater monitoring report within one month of the last sampling event of the year. If during any sampling events, Approval requirements are not met this will be reported to Nova Scotia Environment and Climate Change Inspection Compliance and Enforcement Division (Bedford Office) within 48 hours.

Appendix C

Erosion and ***Sedimentation*** Control Plan

SURFACE WATER MANAGEMENT PLAN

Erosion and Sedimentation Control Plan

As reported in the Environmental Assessment Registration Document, site activities will include overburden excavation and placement of clean fill materials to support installation of the six (6) new multi-purpose tanks and secondary containment dyke, and installation of the 15,000 L oil-water separator. Wastewater treatment equipment and associated piping and appurtenances is generally not expected to require ground disturbance.

As reported in a 2018 Phase II Environmental Site Assessment completed for the subject property, soils at the site are indicated as a mixture of silty sand and clay horizons to 8 m below grade with no bedrock. These soils may be considered erodible, however, infiltration was not measured and hydraulic conductivity is not known. This Erosion and Sedimentation Control Plan proposes to manage sediment related to construction activity in the form of total suspended solids (TSS) only. Other contaminants of concern (e.g. hydrocarbons) are to be monitored and managed under a separate surface water monitoring plan (see the Surface Water Monitoring Program in Appendix B).

Pleasant Street (to the North of the site) is serviced by storm sewers that are expected to intercept offsite runoff before it reaches the site. For this reason, run-on from upgradient surfaces is not anticipated and measures to intercept and divert this water have not been included in these recommendations.

The objectives of this Erosion and Sediment Control Plan are to provide measures and best management practices to minimize erosion and manage sedimentation to protect the marine receiving water environment. The erosion and sediment control features must be compliant to the Nova Scotia Environment Erosion and Sediment Control Handbook for Construction Sites[1]. The TSS concentration in stormwater leaving the site will be monitored by the contractor to ensure compliance with the applicable environmental permitting. This limit is understood to be based on the Canadian Council for Ministers of the Environment (CCME) requirement that no activity shall increase TSS greater than 25 mg/L above background.

Temporary and Permanent Erosion and Sedimentation Control Measures

Dillon recommends an adaptive Erosion and Sedimentation Control Plan incorporating a monitoring program, erosion prevention at the source, and construction of the permanent runoff controls prior to the commencement of other

[1]Nova Scotia Environment. (1988). Erosion and Sedimentation Control Handbook for Construction Sites.

site activities. The plan features are provided in Figure C-1. During construction, the plan should reflect ongoing changes on-site, and should be updated as conditions change due to grading or storm events, and as site activities change. These updates and modifications are expected to be completed by the owner (Envirosoil Limited) and the site contractor.

Prior to the commencement of construction activities, sediment fencing in the form of geotextile filter fabric staked into the ground, or geotextile-wrapped hay bales laid along the ground, should be installed around excavation perimeter.

During any grading activities, surfaces should be stabilized as soon as possible if they are to be exposed for 14 days or longer. This erosion control applies to disturbed soils on-site as well as to stockpiled material. Stabilization should be undertaken as soon as practical, and may consist of hydroseeding, mulching, or laying out hay matting on exposed surfaces.

Any stockpiled material on site should be in compliance with NSECC requirements such as minimizing side slopes, vegetating or covering slopes as soon as possible to prevent erosion, and being physically separated from stormwater controls.

Stormwater will be managed by the existing runoff management features on site (French drain, berm, and stormwater separator; see Figure C-1). This system has been designed to provide adequate storage and conveyance during the 100-year, 24-hour rainfall event. This system will be more than adequate to provide interim runoff and ESC control during the construction phases of the project.

Monitoring Program

It is recommended that a routine monitoring program be implemented. The surface water monitoring program is presented in Appendix B of this report and includes sampling prior to outfall. In addition, visual inspection of the sediment/erosion control measures should be undertaken daily and deposition within the system should be checked weekly at a minimum during construction. If the accumulation of sediment at check dams, geotextile fencing, or the French drain interferes with their function, that ESC feature should be replaced or excavated to restore function. This monitoring and maintenance will be coordinated by the owner and completed by the site contractor. Results of the monitoring program will help to inform the design and type of current and future mitigation measures, allowing for the plan to be adapted to site conditions and to take advantage of natural site drainage conditions where possible.

Additional Measures

If routine and event-based monitoring indicate that the erosion prevention and sedimentation control measures outlined above are not sufficient, more intensive infrastructure measures should be considered. Such measures may include the placement of additional erosion control structures, or other technologies to capture suspended sediments prior to discharge from the site.

275 CHARLOTTE STREET, B1P 1C6

GENERAL NOTES

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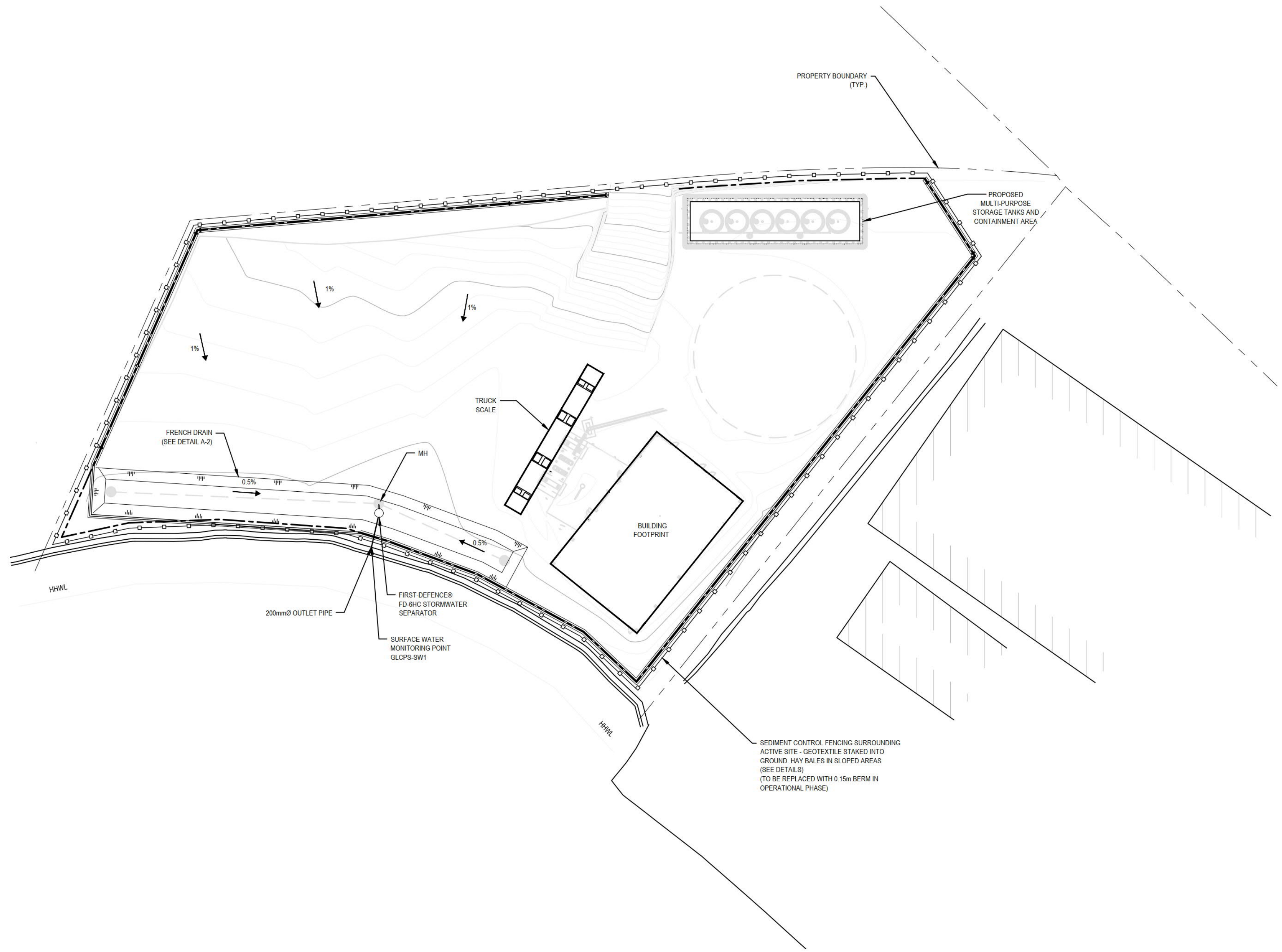
3. GEOTEXTILE FENCING SHOULD SURROUND THE SITE TO KEEP SEDIMENT ON-SITE.
4. ANY EXPOSED SOILS TO REMAIN UNTOUCHED FOR GREATER THAN 14 DAYS MUST BE VEGETATED OR COVERED AS SOON AS POSSIBLE.
5. CONTRACTOR TO TAKE ALL REASONABLE PRECAUTIONS ON SITE TO LIMIT MIGRATION OF SEDIMENTS. THIS WILL INCLUDE MINIMIZING AREA OF DISTURBANCE AT ANY GIVEN TIME, COVERING DISTURBED SOILS, AND PROTECTION OF EXISTING STORM DRAIN INLETS.
6. SITE TO BE GRADED TOWARDS FRENCH DRAIN LEADING TO FIRST DEFENDER FD-6HC.



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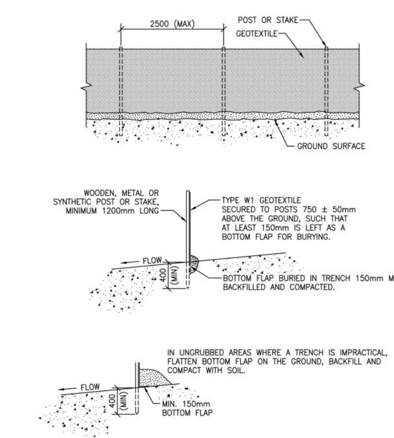

SEDIMENT CONTROL FENCE
NTS

NOTE: EROSION CONTROL DETAILS ADOPTED FROM THE STANDARD SPECIFICATIONS, DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE, NB

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SURFACE WATER MANAGEMENT
PLEASANT STREET, DARTMOUTH, NS

EROSION AND SEDIMENTATION CONTROL PLAN

PROJECT NO. 19-1742

SHEET NO. C-1

Appendix D

2020 Pre- and Post-Development Site Analysis – 750 Pleasant Street

SURFACE WATER MANAGEMENT PLAN

Hydrologic and Hydraulic Analysis

The proposed development consists of the construction of a Liquid Asphalt Storage Facility, located at 750 Pleasant Street, Dartmouth and has an area of approximately 12,039 m^2. The runoff from the study site discharges into the Halifax Harbour.

To quantify and mitigate potential increases in site runoff, an assessment of runoff conditions has been undertaken for both pre- and post-development conditions at the site. The following sections present the findings of this assessment. The existing and proposed site layout conditions used to support this study are provided in the grading plan provided by General Liquids Canada.

Modelling Approach

A review of existing and proposed future site drainage conditions has been undertaken to complete stormwater calculations for the site; see Figure A-1 for the site location. The 100-year return period event was modelled using the 24-hour Chicago design storm developed using the intensity-duration-frequency (IDF) data at Shearwater RCP (ID 8205092).

Figure A-1: Liquid Asphalt Storage Project Area Subcatchments

The Environment and Climate Change Canada Climate Station at the Shearwater Airport (Station ID SHEARWATER RCS 8205092) is less than 1 km from the project site and has a data record of 61 years between 1955 and 2017. The historical data indicates that a 1:2 year return period storm event with 24-hour duration is a 67.49 mm rainfall event. Under a moderate climate change scenario (RCP 4.5)[1] future modelled data indicates a 1:2 year return period storm event with a 24-hour duration is a 71.73 mm rainfall event.

The pre- and post-development conditions were simulated using the latest version of Computational Hydraulics International's PCSWMM software package. The pre-development runoff parameters are provided in Table A-1. The existing forested land was assigned a SCS curve number (CN) of 72 and the impervious tank was assigned a CN of 98.

Table A-1: Pre-Development Runoff Parameters

Subwatershed	Area (ha)	Imperviousness (%)	SCS Curve Number (Pervious)
S1	0.58	12.0	72.00
S2	0.62	0.0	72.00

The post-development condition runoff parameters are provided in Table A-2.

Table A-2: Post-Development Runoff Parameters

Subwatershed	Area (ha)	Imperviousness (%)	SCS Curve Number (Pervious)
S1	0.58	24.0	89
S2	0.62	0.0	89

Item 1: Pre and Post Stormwater Management Conditions Assessment

The results of the pre- and post-development peak flow calculations for the 100-year 24-hour rainfall design event without attenuation of runoff is presented in Table A-3. It can be seen in Table A-3 that the overall discharge from the site is expected to increase.

[1]Schardong, Gaur, Simonovic, Sandink. (2018) Computerized Tool for the Development of Intensity- Duration- Frequency Curves Under a Changing Climate Technical Manual v.3. University of Western Ontario.

Table A-3: Simulation Results for Peak Flow without Mitigation Measures

Rainfall Return Period (years)	Pre-Development Total Peak Flow (L/s)	Post-Development Total Peak Flow (L/s)	Deviation (L/s)
100	110.0	280.0	+170.0

Existing runoff from the site is currently distributed overland (i.e., sheet flow), however under proposed conditions this runoff will be directed to a stone-filled trench along the southern boundary of the property, which is shown in Figure A-2. A perforated 200 mm pipe (i.e., French drain) will be installed in the trench, which will connect to a manhole and oil-water separator that will discharge through a 200 mm pipe to the Halifax Harbour. A 0.15 m high berm with a crest elevation not to exceed the finished floor elevation of the operations building will additionally be constructed on the southern side of the site to direct runoff into the trench.

The increase in runoff peak flow is offset by the storage provided in the stone-filled trench, which includes a 200 mm perforated pipe. The proposed trapezoidal trench provides a cross-sectional area of 5.5 m^2 with a total length of 75 m. The trench will be filled with clear stone having a void space of 0.35, thus providing 166 m^3 of volumetric runoff storage. The simulated storage, French drain, and 200 m pipe attenuates the peak runoff to 114 L/s (Table A-4), representing a minor increase (3.6%) in runoff peak flow.

Table A-4: Simulation Results for Peak Flow with Mitigation Measures

Rainfall Return Period (years)	Pre-Development Total Peak Flow (L/s)	Mitigated Post-Development Total Peak Flow (L/s)	Deviation (L/s)
100	110.0	114.0	4.0

The 4 L/s increase in the peak discharge rate is not expected to have an impact on the receiving body (Halifax Harbour) nor cause adverse stormwater effects to adjacent properties.

To address possible increases in runoff due to climate change, the representative concentration pathway (RCP) 4.5 was used to assess future precipitation conditions. Using the IDF CC (https://www.idf-cc-uwo.ca/) created at the University of Western Ontario. The IDF curve for the Shearwater RCS climate station was projected to 2100 and the resulting IDF data were used to build an updated 100-year, 24-hour Chicago distribution storm with a peak flow of 340 L/s. The additional storage required to

contain the projected future climate change runoff on-site is 15 m^3. Based on the dimensions of the surface area of the trench (75 m x 8.5 m = 637.5 m^2), this results in approximately 2.5 cm of ponding over the trench, which will be contained by the proposed 0.15 m berm.

Item 2: Recommended Plans for Monitoring, Maintenance, and Upgrading of Stormwater Infrastructure

It is recommended that stormwater be managed on-site with site grading, perimeter berms, and an infiltration trench system with a cleanout sump and a Stormceptor® (or equivalent). The site will generally be graded at approximately 1% towards the Harbour. Runoff that flows towards the edge of the property will be intercepted by the perimeter berm, which is intended to keep runoff on-site. The maximum height of the berm should not exceed the finished floor elevation of the operations building to avoid potential water ingress. Maintaining runoff on-site is intended to mitigate total suspended solids (TSS) migration into the harbour. The proposed maximum elevation of the berm has been set to limit excessive ponding on site to mitigate flooding of an adjacent site facilities.

As discussed above, a French drain will be installed to promote infiltration of stormwater. During operations, a 200-mm French drain will collect stormwater and promote infiltration into the stone layer surrounding the pipe. The French drain will lead to a Stormceptor® EFO6 (or equivalent) that will outlet to the Harbour in overflow conditions.

An Imbrium Systems Stormceptor® product is recommended at this site to protect the receiving environment from suspended sediment, floatables and other pollutants. It is expected that the French drain system will be highly effective at removing TSS prior to discharge. The grit-separation capabilities of the Stormceptor® is not a specific requirement given the efficacy of the upstream French drain to capture sediments. Other approved products achieving similar results may also be considered.

For reference the PCSWMM for Stormceptor® online tool was used to determine the adequate Stormceptor size for a 'first flush' equivalent 2-year, 1-hour rainfall event which corresponds to approximately 20mm of rainfall within a 1-hour period . This calculation suggested that the sediment and pollutant mitigation system should be equivalent to or greater than the Stormceptor EFO6 system. Other products meeting or exceeding the EFO6 performance may also be considered. Inspection and maintenance of the unit and outfall shall be performed quarterly to confirm performance. Inspection frequency of the drainage systems shall be re-assessed at the annual reporting period.

Details of the design, orientation, sizing of the infiltration trench system, Stormceptor®, and identification of the associated discharge point, including maintenance recommendations, are included in Figure A-2.

Appendix D

Air Emissions Report

DILLON CONSULTING

ENVIROSOIL LIMITED

Emission Summary Report

Waste Oil Recycling and Water Treatment Facility, Dartmouth, Nova Scotia

November 2021 – 19-1742

Table of Contents

Tables

Appendices

1.0 Introduction and Facility Description

This emissions summary report is provided for a Waste Oil Recycling and Water Treatment Facility that Envirosoil Limited (Envirosoil) is proposing to construct located on a portion of an industrial site located at 750 Pleasant Street in Dartmouth, Nova Scotia (the Facility).

The Facility is proposed to include the following sources of potential air emissions:

- Four (4) oily wastewater storage tanks (55,000 litre [L]);
- Two (2) heated demulsification tanks (55,000 L);
- Two (2) recovered oil storage tanks (17,500 L);
- One (1) recovered oil storage tank (3,170 L)
- Six (6) multi-use storage tanks (90,000 L)
- Two (2) natural gas fired boilers;
- One (1) Oil-water separator

The Facility location is approximately 6 kilometres (km) from the central urban waterfront area of Alderney Landing Ferry Terminal in Dartmouth, NS. The Facility will be operated on properties with past industrial land uses, and will be bordered by industrial properties on each side. These include Cherubini Metal Works Ltd. to the east (PID# 40268849), and the now decommissioned Imperial Oil Refinery (PID# 41463985) to the west. To the north of the main Facility, the property is owned by the Canadian National Railway (PID#00643238) which will be crossed by an access road to Pleasant Street, and to the south is the Halifax Harbour.

The Waste Oil Recycling facility consists of a waste oil recycling and wastewater treatment infrastructure.

This Emission Summary Report was prepared by Dillon Consulting Limited (Dillon) to evaluate the potential air emissions from the Facility's operations.

2.0 Initial Identification of Source and Contaminants

The emission sources associated with the Facility's operations are described in further detail below.

Oily wastewater storage tanks

The Facility will have four (4) above ground fixed roof tanks, 7 m in diameter, each with a 55,000 L capacity. The oily wastewater will be placed in one of these dedicated storage tanks to naturally decant via gravity separation. Treated wastewater is directed to the wastewater treatment system and oil is recovered (directed to recovered oil storage tanks). If the waste oil contains too much emulsified water it is sent to the secondary treatment process (heated demulsification tanks). The expected contaminants from this process are volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs).

Heated demulsification tanks

The Facility will have two (2) above ground fixed roof heated tanks, 3.8 m in diameter, each with a 17,500 L capacity. The waste oil with too much emulsified water will be directed to these heated tanks for demulsification. The waste oil is heated to 50-85 °C to break the emulsion and allow the remaining water to separate from the oil. The expected contaminants from this process are VOCs and PAHs.

Recovered oil storage tanks

The recovered oil from the gravity separation and demulsification process are directed to the recovered oil storage tanks. The Facility will have two (2) above ground fixed roof tanks, 7 m in diameter, with a 55,000 L capacity. The recovered oil will be placed in these tanks for storage prior to being trucked off-site for use at an approved Facility. The expected contaminants from this process are VOCs and PAHs.

There is an additional recovered oil storage tank, with a 3,170 L capacity in the wastewater treatment process. Due to the lack of available information and negligible storage capacity compared to the other storage tanks. This is not considered a significant source of emissions.

Multi-use storage tanks

The Facility will also operate with six (6) multi-use tanks, each with a 90,000 L capacity installed outside the existing building. The Facility will use these tanks to store recovered oil, or store water depending on operational requirements, after treatment prior to off-site transfer.

Natural gas-***fi***red boilers

The Facility is proposed to include two (2) natural gas-fired hot oil boilers for the purpose of heating oil in a closed loop system to regulate the temperature in the demulsification tanks. Each of the boilers will have a heat input capacity rating of 3,000,000 BTU/hr. The expected contaminants from this source are

products of combustion and greenhouse gases (GHGs).The demulsification process will only use a fraction of the heat output from a single boiler; the emissions calculations are using the maximum capacity in the assessment.

Oil-water separator

The Facility's basic wastewater treatment train includes an oil-water separator which will further separate any residual oil in the wastewater which will be directed to the small recovered oil tank. The expected contaminant from this source is greenhouse gases (methane).

3.0 Assessment of the Contaminants and Sources

All expected contaminants were assessed based on the Facility's maximum annual throughput and operating scenario. Where reasonably possible, this assessment considered equipment to be operating simultaneously at their maximum rates and capabilities. Contaminants and emissions sources evaluated during this operating scenario were included in the modelling assessment.

Contaminants with readily available emission factors were calculated. Emissions were calculated following the United States Environmental Protection Agency's (US EPA) Compilation of Air Pollutant Emissions Factors (AP42) and methodologies.

Heated oil used for temperature regulation of the demulsification tanks is contained in a closed-loop system, and is therefore not expected to be emitted during normal operating conditions.

4.0 Operating Conditions, Emission Estimating and Data Quality

This section provides a description of the operating conditions used in the calculation of the emission estimates from the Facility.

4.1 Description of Operating Conditions

The operating condition described in this Report and used for this Assessment assumes operating conditions for the site that would result in the highest emission of each contaminant.

The estimated annual throughputs for each tank included in this assessment are provided in Appendix A. Further detailed emission calculations for tank standing and working losses are documented in Appendix B.

The operating condition assessed also included both Boiler #1 and #2 operating simultaneously at maximum capacities. The individual maximum emission rates corresponding to the maximum annual throughput and worst-case Facility operations have been assessed. Manufacturer specifications for the boilers are provided in Appendix C.

The Facility proposes to install a TIGG corporation N1200-PDB granular activated carbon (GAC) filter to treat all air emissions streams from the storage tanks and heated tanks. From discussions with the manufacturer, it was assumed that the minimum VOC removal rate of the GAC (based on similar operations and GAC filter removal efficiencies) could be anticipated to be approximately 95%. It was conservatively assumed that there would be no removal of PAHs from the GAC. Manufacturer specifications for the TIGG GAC filter is provided in Appendix D.

The TIGG carbon air filter was selected based on successful implementation at the adjacent Liquid Asphalt Storage Facility operated by General Liquids Canada (GLC). The manufacturer recommends a superficial velocity of 10 to 100 cfm/square foot (ft^2) of area. For odour control, the recommendation is reduced to less than 60 cfm/ft^2. The N1200-PDB GAC filter can meet this recommended threshold. Specifications and an operating and maintenance manual for the filter is provided in Appendix D.

4.2 Sample Calculations

The technical rationale, including sample calculations, required to substantiate the emission rates is documented in Appendix A.

5.0 Emission Summary and Conclusions

The emission rate estimates for each source of significant contaminants are documented in Appendix A.

For each contaminant, the annual emission rates are presented in Table 1.

All the emission rates listed in Table 1 are documented and correspond to the operating scenario where all significant sources are operating simultaneously at their maximum annual throughput and operating scenario. Therefore, the emission rates used are not likely to be an underestimate of actual Facility emission rates.

6.0 Limitations

This ESDM report was prepared by Dillon for the sole benefit of our client and is based on information provided to, or obtained by Dillon. We have relied on information provided to us by others and are not responsible or liable for inadequate, incomplete or incorrect information. The material in this report reflects Dillon's judgment in light of the information available to us at the time of preparation.

Table 1
Emission Summary Table
Envirosoil Limited
Waste Oil Recycling and Water Treatment Facility

Contaminant Name	CAS #	Total Facility Emission Rate
		(kg/year)
Total VOCs	--	160.5
n-Alkanes	--	30.6
Branched alkanes	--	59.1
Saturated cycloalkanes	--	8.5
Alkylbenzenes	--	7.2
n-Alkanoic acids	--	2.0
Aromatic acids	--	0.08
PAHs	--	5.8
Alkylated PAHs	--	81.2
Nitrogen Oxides	10102-44-0	52.5
Carbon Monoxide	630-08-0	22.1
Particulate Matter	TSP	2.9
Sulphur Dioxide	7446-09-5	0.03
Total GHGs (CO_2e)	--	92,966.2
Carbon dioxide	124-38-9	91,754.6
Methane	74-82-8	29.4
Nitrous oxide	10024-97-2	1.6

Notes:

(1) Total GHG represented as carbon dioxide equivalents (CO_2e).

Appendix A

Supporting Calculations

Table A.1
Storage Tank Information
Envirosoil Limited
Waste Oil Recycling and Water Treatment Facility

Source Description	# of Tanks	Volume (L)	Diameter (m)	Height (m)	Potential VOC Emissions (Y/N)	Maximum Throughput (L/year)
Unheated Wastewater storage	4	55,000	3.3	7.0	Y	10,500,000
Recovered Oil Storgae Tanks	2	55,000	3.3	7.0	Y	8,000,000
Recovered Oil Storgae Tanks	1	3,170	--	--	Y	
Heated Treater Tanks(1)	2	17,500	2.4	3.8	Y	8,000,000
Multi-Use Storage Tanks	6	90,000	3.6	9.1	Y	8,000,000
Clean Water Storage Tanks	2	55,000	3.3	7.0	N	--

Material	Maximum Estimated Annual Volume (m^3)
Waste Oil(2)	8,000
Wastewater from Treatment of Waste Oil	2,500
Wastewater (all other types)	9,000

Notes:
(1) Demulsification treater tanks are heated to 50-85^{o}C. It is conservatively estimated that all of the recovered oil will pass through the demulsification tanks.
(2) As defined by the NS Used Oil Regulations.

Table A.2
Waste Oil Emission Estimates
Envirosoil Limited
Waste Oil Recycling and Water Treatment Facility

Source Description	Compound	Speciation Profile[1]	Tank Losses (kg/year)[2]	Removal Efficiency %[3]	Emission Rate (kg/year)
Waste Oil Tanks (x 4)	Total VOC	--	897	95	4.48E+01
Demulsification Tanks (x 2)	Total VOC	--	388	95	1.94E+01
Recovered Oil Tanks (x 2)	Total VOC	--	484	95	2.42E+01
Multi-Use Tanks (x 6)	Total VOC	--	1441	95	7.21E+01
			3,211	95	1.61E+02
	n-Decane	0.0121	39	95	1.94E+00
	n-Undecane	0.0113	36	95	1.81E+00
	n-Dodecane	0.0171	55	95	2.75E+00
	n-Tridecane	0.0288	93	95	4.63E+00
	n-Tetradecane	0.0256	82	95	4.11E+00
	n-Pentadecane	0.0277	89	95	4.44E+00
	n-Hexadecane	0.0240	77	95	3.85E+00
	n-Helptadecane	0.0261	84	95	4.19E+00
	n-Octadecane	0.0087	28	95	1.40E+00
	n-Nonadecane	0.0050	16	95	8.01E-01
	n-Eicosane	0.0022	7	95	3.52E-01
	n-Heneicosane	0.0011	4	95	1.75E-01
	n-Docosane	0.0008	2	95	1.21E-01
	n-Tricosane	0.0002	0.7	95	3.53E-02
	n-Tetracosane	0.0001	0.3	95	1.72E-02
Total	n-Alkanes	0.1908	612	95	3.06E+01
	Norfarnesane	0.0115	37	95	1.84E+00
	Farnesane	0.0097	31	95	1.56E+00
	Norpristane	0.0080	26	95	1.28E+00
	Pristine	0.0059	19	95	9.42E-01
	Phytane	0.0048	15	95	7.67E-01
	Other branched alkanes	0.3286	1,055	95	5.27E+01
Total	Branched alkanes	0.3684	1,183	95	5.91E+01
	Heptylcyclohexane	0.0131	42	95	2.11E+00
	Octylcyclohexane	0.0115	37	95	1.84E+00
	Nonylcyclohexane	0.0106	34	95	1.70E+00
	Decylcyclohexane	0.0091	29	95	1.47E+00
	Undecylcyclohexane	0.0062	20	95	9.96E-01
	Dodecylcyclohexane	0.0021	7	95	3.33E-01
	Tridecylcyclohexane	0.0002	0.5	95	2.65E-02
	Tetradecylcyclohexane	0.0000	0.08	95	4.01E-03
Total	Saturated cycloalkanes	0.0528	170	95	8.48E+00

Source Description	Compound	Speciation Profile[1]	Tank Losses (kg/year)[2]	Removal Efficiency %[3]	Emission Rate (kg/year)
	Naphthalene	0.0008	2	--	2.42E+00
	Acenaphthylene	0.0002	0.5	--	5.10E-01
	Acenaphthene	0.0001	0.3	--	2.73E-01
	Fluorene	0.0001	0.3	--	3.21E-01
	Phenanthrene	0.0002	0.8	--	7.93E-01
	Anthacene	0.0000	0.02	--	2.41E-02
	Pyrene	0.0000	0.02	--	1.61E-02
	Biphenyl	0.0004	1	--	1.40E+00
Total	PAHs	0.0018	6	--	5.76E+00
	1-Methylnaphthalene	0.0006	2	--	1.88E+00
	2-Methylnaphthalene	0.0023	7	--	7.36E+00
	1,2-Dimethylnaphthalene	0.0004	1	--	1.20E+00
	1,4-Dimethylnaphthalene	0.0015	5	--	4.94E+00
	1,6-Dimethylnaphthalene	0.0018	6	--	5.80E+00
	1,7-Dimethylnaphthalene	0.0025	8	--	8.18E+00
	2,6-Dimethylnaphthalene	0.0012	4	--	3.93E+00
	2,7-Dimethylnaphthalene	0.0018	6	--	5.90E+00
	Trimethylnaphthalene	0.0123	40	--	3.96E+01
	1-Methylphenanthrene	0.0002	0.8	--	7.77E-01
	2-Methylphenanthrene	0.0005	2	--	1.70E+00
Total	Alkylated PAHs	0.0253	81	--	8.12E+01
	Toluene	0.0014	4	95	2.21E-01
	C2-Benzenes	0.0129	42	95	2.08E+00
	C3-Benzenes	0.0100	32	95	1.61E+00
	C4-Benzenes	0.0097	31	95	1.56E+00
	C5-Benzenes	0.0055	18	95	8.89E-01
	C6-Benzenes	0.0052	17	95	8.38E-01
Total	Alkylbenzenes	0.0448	144	95	7.19E+00
	heptanoic acid	0.0000	0.1	95	6.00E-03
	octanoic acid	0.0001	0.2	95	8.97E-03
	nonanoic acid	0.0001	0.3	95	1.58E-02
	decanoic acid	0.0001	0.4	95	1.93E-02
	undecanoic acid	0.0001	0.3	95	1.61E-02
	dodecanoic acid	0.0009	3	95	1.51E-01
	tridecanoic acid	0.0002	0.8	95	3.80E-02
	tetradecanoic acid	0.0034	11	95	5.46E-01
	pentadecanoic acid	0.0014	5	95	2.29E-01
	hexadecanoic acid	0.0061	20	95	9.81E-01
Total	n-Alkanoic acids[4]	0.0125	40	95	2.01E+00

Source Description	Compound	Speciation Profile[1]	Tank Losses (kg/year)[2]	Removal Efficiency %[3]	Emission Rate (kg/year)
	benzoic acid	0.0005	2	95	7.95E-02
Total	Aromatic acids[4]	0.0005	2	95	7.95E-02

Notes:

(1) Taken from Liang et al, 2005 "The compositional analysis of diesel fuel and diesel emissions with GC/MS" for diesel fuel.

(2) The total emissions were calculated based on US EPA Chapter 7.1 Organic Liquid Storage Tanks. Please refer to Appendix B for detailed tank emission calculations.

(3) The removal efficiency for VOCs as provided by the manufacturer of the carbon filter (TIGG Corporation) via phone conversation on July 29th, 2020. The filter has a conservative ability to remove 95% of VOCs from the air stream, it was assumed that no PAHs were removed by the filter.

(4) Taken from Liang et al, 2005 "The compositional analysis of diesel fuel and diesel emissions with GC/MS" for engine oil.

Table A.3
Boiler Information
Envirosoil Limited
Waste Oil Recycling and Water Treatment Facility

Source Description	Boiler 1	Boiler 2
Make	Heatec	Heatec
Model	HC-300	HC-300
Heat Input Rating (BTU/hr)[(1)]	3,000,000	3,000,000
Natural Gas Consumption (ft^3/hr)[(1)]	3,900	3,900
Duration (hrs/year)[(2)]	730	730
Boiler Capacity (%)[(2)]	30%	30%
Estimated Natural Gas Consumption (m^3/year)	24,185	24,185

Notes:
(1) Provided in manufacturer's specifications in Appendix C.
(2) Provided by Envirosoil.

Table A.4
Natural Gas-Fired Stationary Combustion Equipment Emission Estimates
Envirosoil Limited
Waste Oil Recycling and Water Treatment Facility

Natural Gas Consumption (m^3)			HHV	CO_2 Emissions	CH_4 Emissions	N_2O Emissions
Boiler 1	Boiler 2	Total	(MJ/m^3)[1]	(tonnes)[2]	(tonnes)[3]	(tonnes)[3]
24,185	24,185	48,371	38.0	91.8	0.002	0.002

Natural Gas Emission Factors[4]	CH_4 (g/GJ)	N_2O (g/GJ)
Manufacturing Industries	0.98	0.87

Notes:
(1) Default natural gas HHV taken from Ontario's Guideline for Quantification, Reporting and Verification of Greenhouse Gas emissions, April 2019.
(2) CO2 emissions were estimated using equation 2-11 of the ECCC GHGRP Guidance Document.
(3) CH4 and N2O emissions were estimated using equation 2-13 of the ECCC GHGRP Guidance Document.
(4) Natural gas emission factors taken from Table 2-4 of the ECCC GHGRP Guidance Document.

Table A.5
Natural Gas-Fired Stationary Combustion Equipment Emission Estimates
Envirosoil Limited
Waste Oil Recycling and Water Treatment Facility

Description	Input BTU Rating (BTU/hr)	Capacity	Hours of Operation (hr)	Contaminant	Cas No.	Emission Factor (lb/10^6 BTU input)[1]	Quality Rating	Emissions (kg/year)
Boiler 1	3,000,000	30%	730	Nitrogen Oxides	10102-44-0	0.0880	A	2.62E+01
				Carbon Monoxide	630-08-0	0.0370	A	1.10E+01
				Particulate Matter	TSP	0.0048	A	1.43E+00
				Sulphur Dioxide[2]	7446-09-5	0.00005	A	1.43E-02
Boiler 2	3,000,000	30%	730	Nitrogen Oxides	10102-44-0	0.0880	A	2.62E+01
				Carbon Monoxide	630-08-0	0.0370	A	1.10E+01
				Particulate Matter	TSP	0.0048	A	1.43E+00
				Sulphur Dioxide[2]	7446-09-5	0.00005	A	1.43E-02

Notes:
(1) Emission factors obtained from Power Flame Incorporated data sheet titled " Typical Flue Product Emissions Data for Power Flame Burners" dated February 28, 2012.
(2) Assumed typical 2000 grains of sulfur per million cubit feet of natural gas for sulfur dioxide emission factor calculation

Table A.6
Wastewater Emissions
Envirosoil Limited
Waste Oil Recycling and Water Treatment Facility

Volume of Wastewater Treated (m^3)	NMHC Emission Factor (kg/m^3)[1]	NMHC to CH4 Conversion factor[2]	Total Methane Emissions (tonnes/year)[3]
11,500	0.004	0.6	0.028

Notes:

(1) Taken from Table 200-3 for DAF (uncovered) oil water separators from the Western Climate Initiative [WCI] (Dec, 2010), Final Essential Requirements of Mandatory Reporting.
(2) Taken from WCI.203 (h) of the WCI (Dec, 2010)
(3) Calculated from Equation 200-25 of the WCI (Dec, 2010).

Appendix B

Tanks Losses

Supporting Calculations for Tank Losses

Source: Waste Oil Tanks (x 4), Demulsification Tanks (x 2), Recovered Oil Tanks (x 4), and Multi-Use Tanks (x 6)

Methodology: Emissions of contaminants due to the waste oil storage, demulsification, recovered oil, and multi-use tanks were estimated through accounting for the total losses of waste oil through both working losses and standing losses. Working losses include the filling of the tanks with waste oil. These emissions are estimated from the vapor space that is exhausted during the filling of the tanks. The standing losses for a fixed roof tank occur due to the loss of vapors as a result of the tank vapor space breathing. These standing losses occur during all other time periods and are due to diurnal changes in temperature and pressure causing the oil to expand and release vapor emissions from the tank. The annual losses from the standing losses were estimated at the reasonably worst case conditions. Parameters and values for the tank emissions calculations are provided in Appendix B.

Sample Calculation Methodology: Total Losses of one Waste Oil Tank

Routine Losses from Fixed-Roof Tanks

$$LT = LS + LW$$

Where:

LT = total routine loss, lb/year

LS = standing loss, lb/year

LW = working (withdrawal) loss, lb/year

$$LT = 116.09 + 377.76 = 493.84\ lb/year$$

Standing Losses

$$LT = 365 \times Vv \times Wv \times K_E \times K_S$$

Where:

LS = standing loss, lb/yr

VV = vapor space volume, ft3

WV = stock vapor density, lb/ft3

KE = vapor space expansion factor, per day

KS = vented vapor saturation factor, dimensionless

365 = constant, the number of daily events in a year, (days/year)

$$Vv = \frac{\pi}{4} \times D^2 \times Hvo$$

D = tank diameter, ft

H_{VO} = vapor space outage , ft

$$Hvo = H_S - H_L + H_{RO}$$

H_S = tank shell height, ft

H_L = liquid height, ft; (typically assumed to be at the half-full level, unless known to be maintained at some other level)

H_{RO} = roof outage, ft

$$Wv = \frac{M_V \times P_{VA}}{R \times T_V}$$

W_V = vapor density, lb/ft3

M_V = vapor molecular weight, lb/lb-mole

R = the ideal gas constant, 10.731 psia ft3/lb-mole °R

P_{VA} = vapor pressure at average daily liquid surface temperature, psia

T_V = average vapor temperature, °R

$$P_{VA} = \exp\left[A - \frac{B}{T_{LA}}\right]$$

exp = exponential function

A = constant in the vapor pressure equation, dimensionless

B = constant in the vapor pressure equation, °R

T_{LA} = average daily liquid surface temperature, °R

P_{VA} = true vapor pressure, psia

$$K_E = \frac{\Delta T_V}{T_{LA}} + \frac{\Delta P_V - \Delta P_B}{P_A - P_{VA}}$$

ΔT_V = average daily vapor temperature range, °R

ΔP_V = average daily vapor pressure range, psi

ΔP_B = breather vent pressure setting range, psi

P_A= atmospheric pressure, psia

P_{VA} = vapor pressure at average daily liquid surface temperature, psia

T_{LA} = average daily liquid surface temperature, °R

$$K_S = \frac{1}{1 + 0.053 P_{VA} H_{VO}}$$

Working Losses

$$LW = V_Q \times K_N \times K_P \times W_V \times K_B$$

V_Q = net working loss throughput, ft3/yr

K_N = working loss turnover (saturation) factor, dimensionless

K_P = working loss product factor, dimensionless

W_V = vapor density, lb/ft3

K_B = vent setting correction factor, dimensionless

$$V_Q = 5.614Q$$

Table B.1
Waste Oil Tank (55,000 L x 4) Emissions
Envirosoil Limited
Waste Oil Recycling and Water Treatment Facility

Tank Variables[1]

Variable	Symbol	Unit	Value
Vapor Molecular Weight	M_V	lb/lb-mole	200
Atmospheric Pressure[2]	P_A	psia	14.5
Tank Paint Solar Absorptance	α	-	0.97
Breather Vent Pressure Setting Range	ΔP_B	psi	0.06
Tank Shell Height	H_S	ft	22.8
Tank Shell Diameter	D	ft	10.8
Vapor Space Outage	H_{VO}	ft	11.42
Roof Outage	Hro	ft	0.00
Tank Vapor Space Volume	V_V	ft^3	1036
Maximum Tank Volume	V_{LX}	ft^3	2072
Annual Net Throughput	Q	bbl/yr	16,511
Net Working Loss Throughput	V_Q	ft3/yr	92,691
Number of Turnovers	N	-	45
Working Loss Turnover Factor	K_N	-	0.84
Working Loss Product Factor	K_P	-	1
Vent Setting Correction Factor	K_B	-	1
Breather Vent Vacuum Setting	Pbv	psig	-0.03
Breather Vent Pressure Setting	Pbp	psig	0.03
Daily Max Ambient Temperature	T_{AX}	^oF	68.00
Daily Minumum Ambient Temperature	T_{AN}	^oF	59.00
Daily Total Solar Insolation[3]	I	Btu/(ft^2-day)	1151
Daily Average Liquid Surface Temperature	T_{LAA}	^oR	527.67
Daily Maximum Liquid Surface Temperature	T_{LAX}	^oR	527.67
Daily Minumum Liquid Surface Temperature	T_{LAN}	^oR	527.67
Vapor Pressure at Daily Average Liquid Surface Temperature	P_{VA}	psia	0.14
Vapor Pressure at Daily Maximum Liquid Surface Temperature[1]	P_{VX}	psia	0.15
Vapor Pressure at Daily Minimum Liquid Surface Temperature[1]	P_{VN}	psia	0.13
Daily Vapor Temperature Range	ΔT_V	^oR	37.73
Daily Vapor Pressure Range	ΔP_V	psi	0.01
Vapor Space Expansion Factor	K_E	-	0.07
Vented Vapor Saturation Factor	K_S	-	0.92
Stock Vapor Density	W_V	lb/ft^3	0.00487
Standing Losses	L_S	lb/yr	116.09
Working Losses	L_W	lb/yr	377.76
Total Losses	L_T	lb/yr	493.84

Notes:
(1) Taken from USEPA AP-42, Chapter 7.1 - Organic Liquid Storage Tanks, variables calculated for fixed-roof vertical tank.
(2) Based on 1981-2010 climate normals data for Halifax Standfiel International Airport obtained from climate.weather.gc.ca.
(43 Daily total solar insolation obtained from Dartmouth source:
https://www.energyhub.org/solar-energy-maps-canada/#solar-energy-maps-canada

Table B.2
Heated Treater Tank (17,500 L x 2) Emissions
Envirosoil Limited
Waste Oil Recycling and Water Treatment Facility

Tank Variables[1]

Variable	Symbol	Unit	Value
Vapor Molecular Weight	M_V	lb/lb-mole	200
Atmospheric Pressure[2]	P_A	psia	14.5
Tank Paint Solar Absorptance	α	-	0.97
Breather Vent Pressure Setting Range	ΔP_B	psi	0.06
Tank Shell Height	H_S	ft	12.3
Tank Shell Diameter	D	ft	8.0
Vapor Space Outage	H_{VO}	ft	6.17
Roof Outage	Hro	ft	0.00
Tank Vapor Space Volume	V_V	ft^3	310
Maximum Tank Volume	V_{LX}	ft^3	620
Annual Net Throughput	Q	bbl/yr	25,159
Net Working Loss Throughput	V_Q	ft3/yr	141,244
Number of Turnovers	N	-	228
Working Loss Turnover Factor	K_N	-	0.30
Working Loss Product Factor	K_P	-	1
Vent Setting Correction Factor	K_B	-	1
Breather Vent Vacuum Setting	Pbv	psig	-0.03
Breather Vent Pressure Setting	Pbp	psig	0.03
Daily Max Ambient Temperature	T_{AX}	^oF	68.00
Daily Minumum Ambient Temperature	T_{AN}	^oF	59.00
Daily Total Solar Insolation[3]	I	Btu/(ft^2-day)	1151
Daily Average Liquid Surface Temperature	T_{LAA}	^oR	644.67
Daily Maximum Liquid Surface Temperature	T_{LAX}	^oR	644.67
Daily Minumum Liquid Surface Temperature	T_{LAN}	^oR	644.67
Vapor Pressure at Daily Average Liquid Surface Temperature	P_{VA}	psia	0.31
Vapor Pressure at Daily Maximum Liquid Surface Temperature[1]	P_{VX}	psia	0.31
Vapor Pressure at Daily Minimum Liquid Surface Temperature[1]	P_{VN}	psia	0.31
Daily Vapor Temperature Range	ΔT_V	^oR	37.73
Daily Vapor Pressure Range	ΔP_V	psi	0.00
Vapor Space Expansion Factor	K_E	-	0.05
Vented Vapor Saturation Factor	K_S	-	0.91
Stock Vapor Density	W_V	lb/ft^3	0.00896
Standing Losses	L_S	lb/yr	49.97
Working Losses	L_W	lb/yr	377.59
Total Losses	L_T	lb/yr	427.56

Notes:
(1) Taken from USEPA AP-42, Chapter 7.1 - Organic Liquid Storage Tanks, variables calculated for fixed-roof vertical tank.
(2) Based on 1981-2010 climate normals data for Halifax Standfiel International Airport obtained from climate.weather.gc.ca.
(43 Daily total solar insolation obtained from Dartmouth source:
https://www.energyhub.org/solar-energy-maps-canada/#solar-energy-maps-canada

Table B.3
Recovered Oil Tank (55,000 L x 2) Emissions
Envirosoil Limited
Waste Oil Recycling and Water Treatment Facility

Tank Variables[1]

Variable	Symbol	Unit	Value
Vapor Molecular Weight	M_V	lb/lb-mole	200
Atmospheric Pressure[2]	P_A	psia	14.5
Tank Paint Solar Absorptance	α	-	0.97
Breather Vent Pressure Setting Range	ΔP_B	psi	0.06
Tank Shell Height	H_S	ft	22.8
Tank Shell Diameter	D	ft	10.8
Vapor Space Outage	H_{VO}	ft	11.42
Roof Outage	Hro	ft	0.00
Tank Vapor Space Volume	V_V	ft^3	1036
Maximum Tank Volume	V_{LX}	ft^3	2072
Annual Net Throughput	Q	bbl/yr	25,159
Net Working Loss Throughput	V_Q	ft3/yr	141,244
Number of Turnovers	N	-	68
Working Loss Turnover Factor	K_N	-	0.61
Working Loss Product Factor	K_P	-	1
Vent Setting Correction Factor	K_B	-	1
Breather Vent Vacuum Setting	Pbv	psig	-0.03
Breather Vent Pressure Setting	Pbp	psig	0.03
Daily Max Ambient Temperature	T_{AX}	^oF	68.00
Daily Minumum Ambient Temperature	T_{AN}	^oF	59.00
Daily Total Solar Insolation[3]	I	Btu/(ft^2-day)	1151
Daily Average Liquid Surface Temperature	T_{LAA}	^oR	527.67
Daily Maximum Liquid Surface Temperature	T_{LAX}	^oR	527.67
Daily Minumum Liquid Surface Temperature	T_{LAN}	^oR	527.67
Vapor Pressure at Daily Average Liquid Surface Temperature	P_{VA}	psia	0.14
Vapor Pressure at Daily Maximum Liquid Surface Temperature[1]	P_{VX}	psia	0.15
Vapor Pressure at Daily Minimum Liquid Surface Temperature[1]	P_{VN}	psia	0.13
Daily Vapor Temperature Range	ΔT_V	^oR	37.73
Daily Vapor Pressure Range	ΔP_V	psi	0.01
Vapor Space Expansion Factor	K_E	-	0.07
Vented Vapor Saturation Factor	K_S	-	0.92
Stock Vapor Density	W_V	lb/ft^3	0.00487
Standing Losses	L_S	lb/yr	116.09
Working Losses	L_W	lb/yr	417.14
Total Losses	L_T	lb/yr	533.22

Notes:
(1) Taken from USEPA AP-42, Chapter 7.1 - Organic Liquid Storage Tanks, variables calculated for fixed-roof vertical tank.
(2) Based on 1981-2010 climate normals data for Halifax Standfiel International Airport obtained from climate.weather.gc.ca.
(43 Daily total solar insolation obtained from Dartmouth source:
https://www.energyhub.org/solar-energy-maps-canada/#solar-energy-maps-canada

Table B.4
Waste Oil Tank (90,000 L x 6) Emissions
Envirosoil Limited
Waste Oil Recycling and Water Treatment Facility

Tank Variables[1]

Variable	Symbol	Unit	Value
Vapor Molecular Weight	M_V	lb/lb-mole	200
Atmospheric Pressure[2]	P_A	psia	14.5
Tank Paint Solar Absorptance	α	-	0.97
Breather Vent Pressure Setting Range	ΔP_B	psi	0.06
Tank Shell Height	H_S	ft	29.8
Tank Shell Diameter	D	ft	11.7
Vapor Space Outage	H_{VO}	ft	14.92
Roof Outage	Hro	ft	0.00
Tank Vapor Space Volume	V_V	ft^3	1595
Maximum Tank Volume	V_{LX}	ft^3	3189
Annual Net Throughput	Q	bbl/yr	8,386
Net Working Loss Throughput	V_Q	ft3/yr	47,081
Number of Turnovers	N	-	15
Working Loss Turnover Factor	K_N	-	1.00
Working Loss Product Factor	K_P	-	1
Vent Setting Correction Factor	K_B	-	1
Breather Vent Vacuum Setting	Pbv	psig	-0.03
Breather Vent Pressure Setting	Pbp	psig	0.03
Daily Max Ambient Temperature	T_{AX}	^oF	68.00
Daily Minumum Ambient Temperature	T_{AN}	^oF	23.00
Daily Total Solar Insolation[3]	I	Btu/(ft^2-day)	1151
Daily Average Liquid Surface Temperature	T_{LAA}	^oR	527.67
Daily Maximum Liquid Surface Temperature	T_{LAX}	^oR	527.67
Daily Minumum Liquid Surface Temperature	T_{LAN}	^oR	527.67
Vapor Pressure at Daily Average Liquid Surface Temperature	P_{VA}	psia	0.14
Vapor Pressure at Daily Maximum Liquid Surface Temperature[1]	P_{VX}	psia	0.15
Vapor Pressure at Daily Minimum Liquid Surface Temperature[1]	P_{VN}	psia	0.13
Daily Vapor Temperature Range	ΔT_V	^oR	63.65
Daily Vapor Pressure Range	ΔP_V	psi	0.01
Vapor Space Expansion Factor	K_E	-	0.12
Vented Vapor Saturation Factor	K_S	-	0.90
Stock Vapor Density	W_V	lb/ft^3	0.00487
Standing Losses	L_S	lb/yr	300.00
Working Losses	L_W	lb/yr	229.13
Total Losses	L_T	lb/yr	529.13

Notes:
(1) Taken from USEPA AP-42, Chapter 7.1 - Organic Liquid Storage Tanks, variables calculated for fixed-roof vertical tank.
(2) Based on 1981-2010 climate normals data for Halifax Standfiel International Airport obtained from climate.weather.gc.ca.
(43 Daily total solar insolation obtained from Dartmouth source:
https://www.energyhub.org/solar-energy-maps-canada/#solar-energy-maps-canada

Appendix C

Boiler Manufacturer Specifications

HELICAL COIL HEATERS

FOR HOT MIX ASPHALT

HC-120 with side pumps and Stackpack heat exchanger

HEATEC THERMAL FLUID (hot oil) heaters for the hot mix asphalt (HMA) industry are designed around a helical coil. Our coil meets ASME code.

Although we make several other types of heaters for other industries, our helical coil heaters are the most popular heater in the HMA industry. Their popularity comes from their simplicity, efficiency, low maintenance and relatively low cost.

MODELS AND OUTPUTS

Nine standard models are available. Rated thermal outputs range from 0.7 to 4 million Btu per hour. All can be customized to meet your specific needs.

TWO BASIC CONFIGURATIONS

Heatec helical coil heaters are available in two basic configurations: HC and HCS. The HC configuration (above) has a manifold that enables the heater to operate with multiple thermal fluid circuits.

HEATEC

Heatec HCS helical coil heater for single thermal fluid circuit

LH side of Heatec HCS helical coil heater

The HCS configuration is virtually identical to the HC except that it is intended to operate with a single circuit. It has no manifold.

HCS heater can be upgraded

However, the HCS heater can be upgraded to the HC configuration by adding an optional manifold. The upgrade can be done at any time as needed.

High efficiency reduces costs

A hallmark of our helical coil heater is high thermal efficiency. Thermal efficiencies of our standard heaters range up to 85 percent LHV, depending upon fluid outlet temperature and fuel.

Thermal efficiency is the total amount of heat produced by the burner versus the portion actually transferred to thermal fluid flowing through the coil. Thus, in our heaters, up to 85 percent of the total heat is transferred to the thermal fluid. Increasing efficiency reduces fuel usage.

Achieving super-efficiency

Adding a **STACKPACK™** heat exchanger boosts thermal efficiency another 5 percent. It makes our current heater super-efficient. That extra percentage reduces monthly fuel usage by 261 gallons of No. 2 fuel oil or 345 therms of natural gas. The Stackpack heat exchanger usually pays for itself in a year or less.

Controls

Heater controls automatically maintain the operating temperature set by the operator. Accuracy is within a half percent of set temperature. The temperature of thermal fluid at the heater's outlet can be maintained up to 450 degrees F (depending on variables).

Numerous safety features ensure heater operation is always within prescribed limits. Heaters shut down automatically if an abnormal operating condition occurs.

Switches and sensors in a ***limit*** circuit ensure normal operation. They monitor burner flame, thermal fluid temperature, exhaust gas temperature, flow of thermal fluid, and combustion air pressure.

Burner controls

Fireye™ burner management controls known as BurnerLogix™ provide proper and safe operation of the burner. They include a display, burner control, programmer, annunciator and flame scanner.

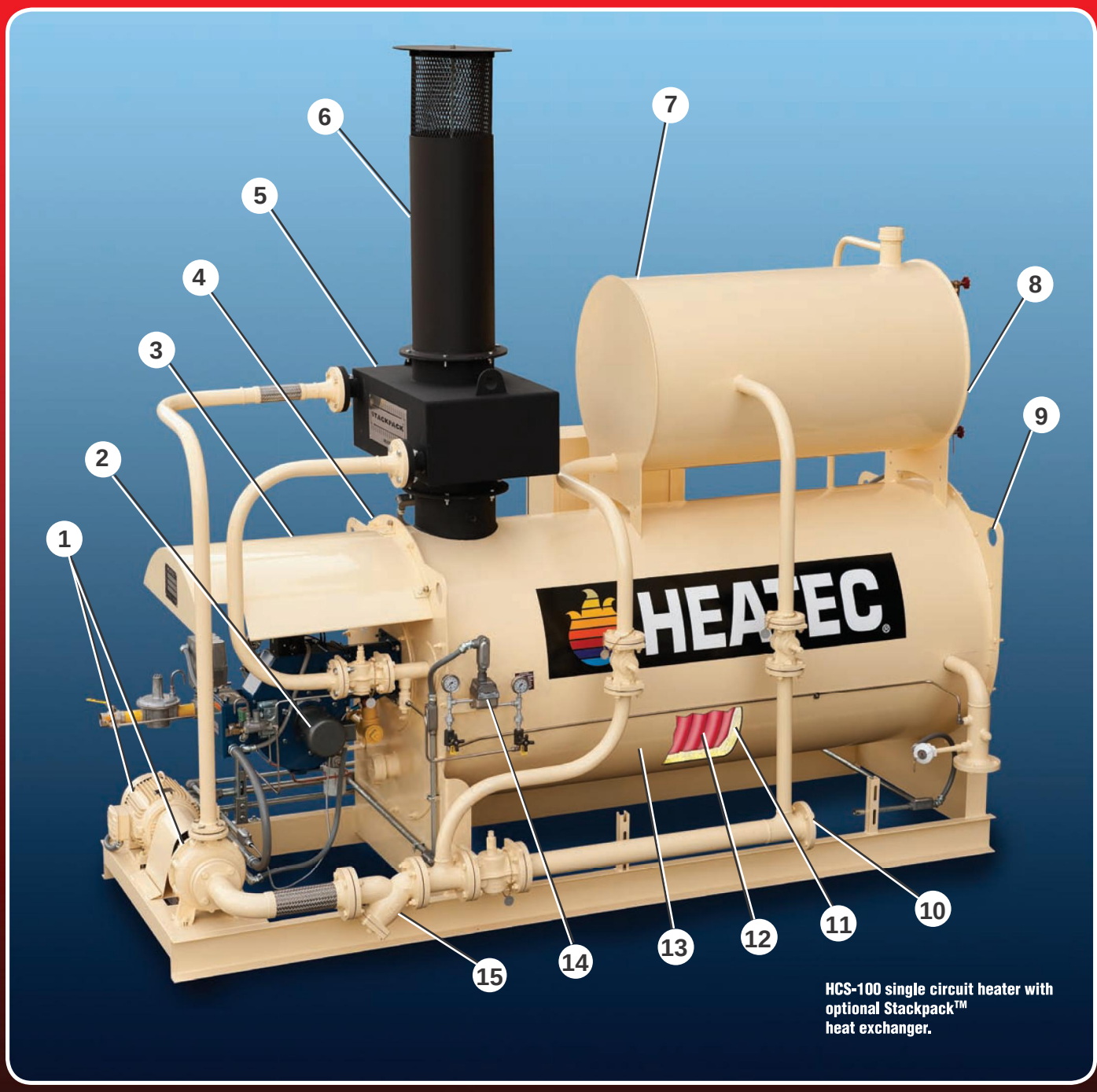
The burner control uses a microprocessor for its management functions. The processor provides the proper burner sequencing, ignition and flame monitoring protection.

The controls provide important messages about the operating status of the heater. If there is an alarm condition, a message will appear on the display. The message identifies the cause of the alarm, including which safety device in the *limit* circuit may have caused the shuddown.

Control panel

Main controls are in a UL approved NEMA-4 panel, which protects against windblown dust and rain, splashing water and hose-directed water. Wiring workmanship is meticulous and meets strict standards. All wires and terminals are labeled for easy identification of circuits. A laminated circuit diagram is furnished.

NOTE: Fireye and BurnerLogix are trademarks of Fireye, Inc.



HCS-100 single circuit heater with optional Stackpack™ heat exchanger.

1. Hot oil (thermal fluid) recirculation pump and motor.
2. Fully modulating burner.
3. Rain shield.
4. End plates bolt on and have lifting eyes.
5. Stackpack™ heat exchanger (optional).
6. Exhaust stack.
7. Thermal fluid expansion tank.
8. Low media level switch (not visible).
9. One of four lifting eyes.
10. Single circuit configuration shown can be upgraded to multiple circuit by adding manifold.
11. 3" ceramic fiberglass insulation.
12. Helical coil. Built to ASME code.
13. Heater shell. Welded A-36 steel plate.
14. Pressure differential switch.
15. Thermal fluid Y-strainer.

SPECIFICATIONS

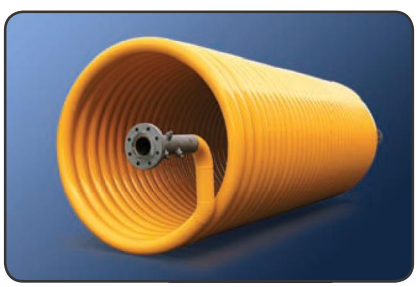
BASIC MODEL	MAXIMUM OUTPUT	FUEL USED PER HOUR		RECIRCULATION PUMP		EXPANSION TANK	APPROXIMATE OVERALL SIZE			NET WEIGHT
	Btu/Hour	No. 2 Fuel Oil Gallons	Natural Gas Cubic feet/hour	Hp	GPM	Gallons	Length	Width	Height	Pounds
SINGLE CIRCUIT HEATERS										
HCS-70	700,000	6	910	10	100	100	10'-5"	5'-7"	8'-10"	3,700
HCS-100	1,200,000	11	1,560	10	100	175	12'-1"	5'-9"	9"-0"	5,000
HCS-175	2,000,000	18	2,600	15	150	280	14'-5"	6'-3"	9'-7"	6,500
HCS-250	3,000,000	27	3,900	15	150	280	15'-9"	7'-4"	10'-6"	9,300
HCS-350	4,000,000	36	5,200	15	200	400	18'-1"	7'-4"	11'-5"	10,700
MULTI-CIRCUIT HEATERS										
HC-120	1,200,000	11	1560	10	100	175	12'-1"	5'-11"	9"-0"	5,100
HC-200	2,000,000	18	2600	15	150	280	14'-5"	6'-5"	9'-7"	6,600
HC-300	3,000,000	27	3,900	15	150	280	15'-9"	7'-6"	10'-6"	9,500
HC-400	4,000,000	36	5,200	15	200	400	18'-1"	7'-6"	11'-5"	10,900

The amount of fuel used is for a thermal efficiency of 85% and one hour of operation at maximum output. A properly sized heater normally runs for intermittent periods at lower outputs. No. 2 fuel usage is based on 132,000 Btu per gallon, its LHV (low heating value). Natural gas usage is based on 905 Btu per cubic foot, its LHV. Heights include the exhaust stack without a Stackpack heat exchanger. The Stackpack exchanger for the HCS-350 and HC-400 weighs 800 pounds and adds 2'-7" to their height. For all other models it weighs 460 pounds and adds 1'-9" to their height.

NOTE: Specifications are subject to change without prior notice or obligation.

Burner modulation

The heater has a fully modulating burner with appropriate turndown ratios. Modulation allows its firing rate to closely match the heat demand. This conserves fuel, reduces temperature overshooting and eliminates constant on-off recycling.



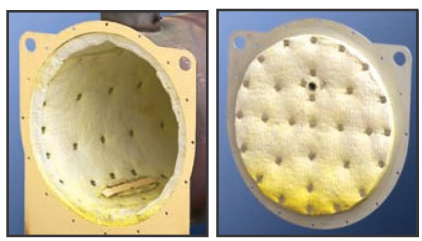
Helical coils

Helical coils in our heaters set us apart from others that produce helical coil heaters for the HMA industry. We are the only heater manufacturer that builds *all* coils to ASME code. Certification is optional.

Coils in HCS heaters have a three year warranty. Coils in HC heaters have a five year warranty.

Insulation

The shell of our heater is fully insulated with 3 inches of ceramic fiberglass insulation. The end plates are also insulated. All insulation is treated to retard errosion.



Options

Options include: Stackpack heat exchanger, seven-day time clock, sock filter, automated monitor (dialer), burners for various fuels, and steel valves. A variety of electrical power options are available.

Factory testing and startup

All HC and HCS heaters are factory-tested. We provide startup services with fees based on time at site plus travel time and expenses.

Warranty and factory support

Our heaters have a one-year limited warranty. Additionally, the coils have an extended warranty as noted earlier. Round-the-clock support is available from our in-house parts and service departments.

HEATEC

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Power Flame Incorporated

9/28/2006
Rev. 02/28/2012

Typical Flue Product Emissions
Data for Power Flame Burners

	Natural Gas	L.P. Gas	# 2 Fuel Oil [1]
Carbon Monoxide - CO	.037 lb CO 10^6 BTU input (50 PPM)	.037 lb CO 10^6 BTU input (50 PPM)	.037 lb per 10^6 BTU INPUT (50 PPM)
Sulfur Dioxide - SO_2	(1.05) x (% Sulfur by weight in fuel) = lb SO_2 per 10^6 BTU Input		
Particulate Matter	.0048 lb PM per 10^6 BTU input	.0048 lb PM per 10^6 BTU input	.0143 lb PM per 10^6 BTU input
Hydrocarbons	.025 lb HC's per 10^6 BTU input	.025 lb HC's per 10^6 BTU input	.038 lb HC's per 10^6 BTU input
CO_2	9 % to 10%	10% to 12%	10% to 13%
Nitrogen Oxides - NO_x			
Standard J, FDM & X4 Gas Burners	.088 lb NO_x per 10^6 BTU input (75 PPM)	.092 lb NO_x per 10^6 BTU input (75 PPM)	N/A N/A
Standard C(R) Burners	.088 lb NO_x per 10^6 BTU input (75 PPM)	.092 lb NO_x per 10^6 BTU input (75 PPM)	.12 lb NO_x per 10^6 BTU Input (90) PPM[2]
LNIC(R) Burners Fire box/Cast Iron boilers	.029 lb NO_x per 10^6 BTU input (25 PPM)	.031 lb NO_x per 10^6 BTU input (25 PPM)	.12 lb NO_x per 10^6 BTU Input (90) PPM[2]
LNIC(R) Burners Water tube boilers	.024 lb NO_x per 10^6 BTU input (20 PPM)	.031 lb NO_x per 10^6 BTU input (25 PPM)	.12 lb NO_x per 10^6 BTU Input (90) PPM[2]
LNIAC Burners	.029 lb NO_x per 10^6 BTU input (25 PPM)	.031 lb NO_x per 10^6 BTU input (25 PPM)	.12 lb NO_x per 10^6 BTU Input (90) PPM
CM Burners	.070 lb NO_x per 10^6 BTU input (60 PPM)[4]	.074 lb NO_x per 10^6 BTU input (60 PPM)[4]	.146 lb NO_x per 10^6 BTU Input (110) PPM
LNICM Burners Scotch Boiler	.033 lb NO_x per 10^6 BTU input (30) PPM	.033 lb NO_x per 10^6 BTU input (30) PPM	.12 lb NO_x per 10^6 BTU Input (90) PPM
LNICM Burners Fire box/Cast Iron boilers	.029 lb NO_x per 10^6 BTU input (25) PPM	.031 lb NO_x per 10^6 BTU input (25) PPM	.12 lb NO_x per 10^6 BTU Input (90) PPM
LNICM Burners Water tube boilers	.029 lb NO_x per 10^6 BTU input (20) PPM	.031 lb NO_x per 10^6 BTU input (20) PPM	.12 lb NO_x per 10^6 BTU Input (90) PPM
NPM Premix Burners	.029 lb NO_x per 10^6 BTU input (25) PPM	.031 lb NO_x per 10^6 BTU input (25) PPM	N/A N/A
Nova Plus Burners NVC AND NP2	.010 lb NO_x per 10^6 BTU input (9) PPM	.015 lb NO_x per 10^6 BTU input (12) PPM	N/A N/A

(1) NOx emissions at 3 % 02 will vary based on the percent of fuel bound nitrogen (these are based on .02%) and boiler or heat exchanger configurations

(2) 90 PPM NOx on cast iron sectional, fire box and water tube boiler, 120 PPM on fire tube boilers. (.159 lb NOx per 10^6 BTU Input)

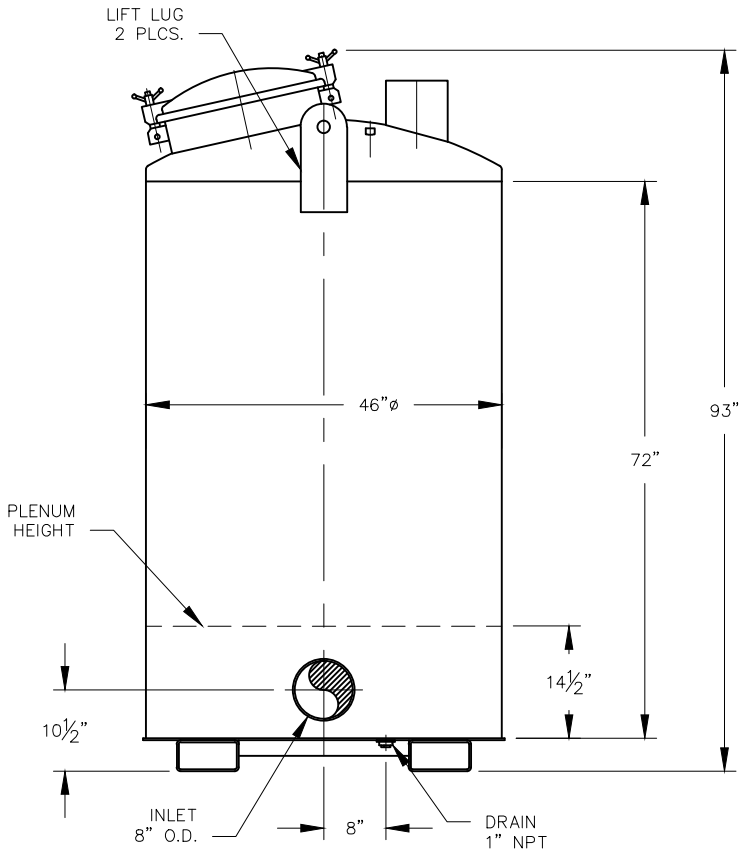
(3) Burning natural gas the VOC are estimated at 0.003 # per million BTU and SO_x are 0.0005 # per million BTU.

(4) In some applications the CMAX will achieve less than 60 PPM without flue gas recirculation - consult factory.

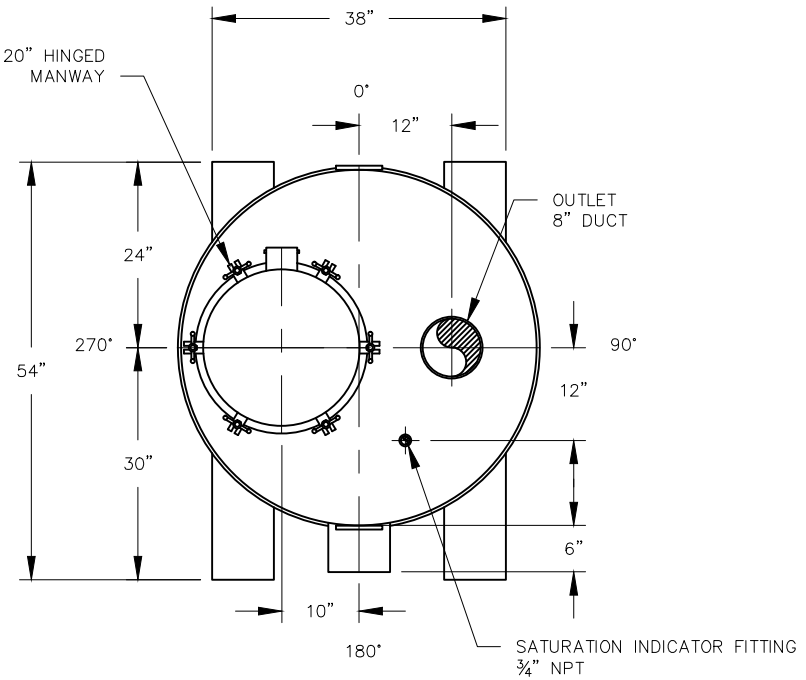
These emission rates are general estimates and do not constitute guarantees by Power Flame Inc.
In instances where guarantees are required, please consult the factory with the specific application information.
All NOx numbers stated are corrected to 3% O_2

Appendix D

Carbon Filter Manufacturer Specifications



ELEVATION



PLAN

* STAINLESS STEEL BED RETENTION PLATE.
140°F WITH PE PLATE

VESSEL STANDARDS

VESSEL MATERIALS : SA-36	VESSEL ACCESS : 20" HINGED MANWAY
LINING : EPOXY	LIQUID DRAIN ASSEMBLY : 1" NPT W/ HDPE PLUG
EXTERIOR PAINT : EPOXY BASE W/ URETHANE TOP COAT	MAX. MEDIA FILL : 54 FT^3
HEAD THICKNESS : 3/16" NOM.	SHIP WT. EMPTY : 1200 LBS
SHELL THICKNESS : 3/16" NOM.	MAX. OPERATING PRESSURE : 15 PSIG
INTERNALS : STAINLESS STEEL PLENUM	MAX. OPERATING TEMPERATURE. : 180°F

NO.	REVISION	BY	DATE
7	ADD LIFT LUGS	JB	4/11/11
6	UPDATE VESSEL STANDARDS	JB	8/24/10
5	CHANGE MANWAY TO HINGED STYLE	JB	9/6/06
4	REVISE CARBON FILL	JB	1/20/04
3	REMOVE VENT	JB	5/14/03
2	CHANGE EXTERIOR PAINT	JB	5/7/03
1	TITLE BLOCK	JB	1/10/03

PROJECT
N-1200-PDB

PROJ. NO. SALES
P.O. NO.

DRAWN BY	JB
DESIGN BY	BL
CHKD. BY	BL
DATE	9/24/02
SCALE	NTS

TIGG corporation

PLAN & ELEVATION

N-1200-PDB-1001 REV. 7

NIXTOX PDB - Premium Vapor Purification Units

Modular Activated Carbon Vapor Phase Adsorbers

TIGG's NIXTOX PDB series of activated carbon adsorbers are designed for vapor phase environmental Remediation and industrial processing applications involving the removal of contaminants from air and other vapors.

NIXTOX PDB vessels feature a specially constructed bed support, which creates a plenum chamber. This permits even flow distribution and efficient utilization of the activated carbon media.

These vapor phase vessels are fabricated of carbon steel and have a high solids epoxy lining. The units can also be built with different construction materials and linings. The adsorbers are fitted with lifting lugs and fork channels. Manways are 20" in diameter for easy access and removal and
replacement of carbon or other media. Manways are 18" x 14" elliptical located on top of tank for easy access and vessels are supplied with 4" x 6" hand holes on bottom side. Legs and fork
channels are provided on the CP5000 and smaller vessels, larger vessels have legs only.

NOTES

- Desired contact time may allow higher or lower flow rates
- Adsorbent fill based on 27 lbs./ft.bed density
- Adsorbent fill differs based on variable bed density and alternate adsorbents

Model #	Max Flow (cfm)	Max Press (psig)	Max Temp (deg F)	Inlet/ Outlet (inches)	Diamater/ Height (inches)	Standard Adsorb Fill (lbs)	Maximum Adsorb Fill (lbs)	Shipping Wt Std Fill (lbs)
N-750 PDB	750	15	180	6/6	38/81	650	700	1,500
N-1200 PDB	1,200	15	180	8/8	46/94	1,000	1,400	2,200
N-1800 PDB	1,800	15	180	10/10	57/95	1,500	2,000	2,925
N-2500 PDB	2,500	15	180	12/12	68/96	2,000	2,700	4,000
N-4000 PDB	4,000	15	180	14/14	85/110	3,200	5,200	5,950
N-5000 PDB	5,000	15	180	20/20	96/120	4,400	7,400	8,400

TIGG®
a newterra company

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NIXTOX® PDB

2/08

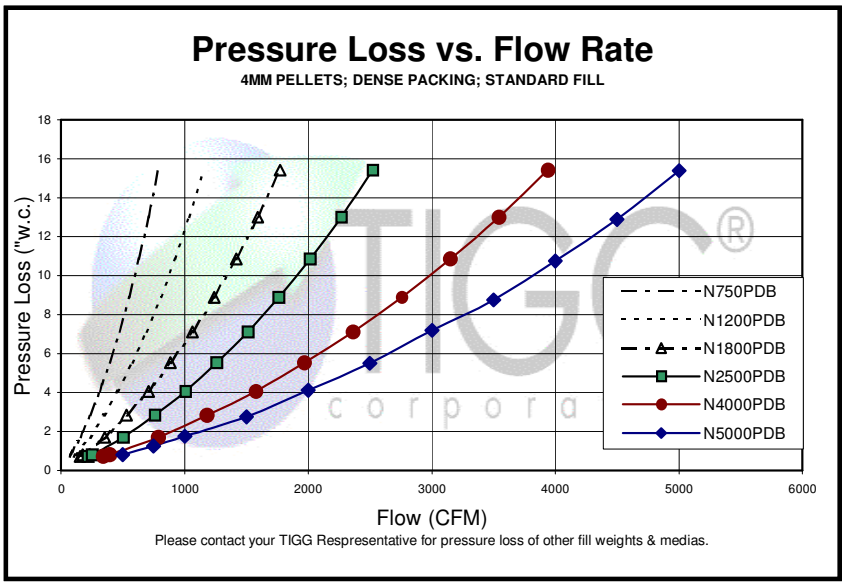
STEEL VESSELS

MODEL	MAXIMUM FLOW (CFM)	MAX PRESS (PSIG)	MAX TEMP (deg F)	INLET / OUTLET (IN)	DIAMETER / APPROX HEIGHT (IN)	STANDARD ADSORBENT FILL (LBS)	MAXIMUM ADSORBENT FILL (LBS)	SHIPPING WEIGHT - STANDARD FILL (LBS)
N-750 PDB	750	15	180	6 / 6	38 / 81	650	700	1500
N-1200 PDB	1200	15	180	8 / 8	46 / 94	1000	1400	2200
N-1800 PDB	1800	15	180	10 / 10	57 / 95	1500	2000	2925
N-2500 PDB	2500	15	180	12 / 12	68 / 96	2000	2700	4860
N-4000 PDB	4000	15	180	14 / 14	85 / 110	3200	5200	5935
N-5000 PDB	5000	15	180	20 / 20	96 / 126	4400	7400	7515

NOTES:

1) Desired contact time may allow higher or lower flow rates.
2) Dry virgin activated or reactivated carbon provided as standard adsorbent.
3) Adsorbent fill is based on a poured density of 27 lb/ft^3.
4) Adsorbent fill can differ based on variable bed density and alternate adsorbents.
5) Pressure drop curves are based on a dense packed bed of activated carbon.
6) Maximum temperature is based on unit with stainless steel bed retention plate; units with PE plates have maximum temperature of 140 deg. F.

The NIXTOX Series Modular Adsorbers are designed for applications with relatively high flow rates or where more on-line adsorbent is required. Model numbers reflect maximum design flow for air and other vapors. The vessels are fabricated of carbon steel and provided with a high solids epoxy lining. Where process conditions dictate, the vessels can be fabricated from other materials such as stainless steel. In addition, a different lining can be substituted for the high solids epoxy. Manways are 20 inches in diameter, hinged style, for easy access and the removal and replacement of carbon or other media. The vessels are provided with fork channels. *Specifications and properties are subject to change without notice.*



N-1200 PDB ILLUSTRATION

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Operation and Maintenance Manual for NIXTOX and Econosorb-V Vapor Phase Units

CONTENTS PAGE

1.0 GENERAL

Standard adsorbent is *virgin* granular or pelletized vapor phase coal based activated carbon and is normally installed prior to shipment. These units are designed to operate in the upflow mode. If the inlet organic contaminant concentrations exceed 500 ppm and the air flow is less than 50ft^3/min, significant heat of adsorption may be generated. Prewetting the adsorbent with water is recommended in these cases, in order to minimize the chance of ignition.

In all cases of a combustible source of air or gases, a suitable **bi-directional detonation flame arrestor** should be installed between the source and the adsorber. TIGG premounts arrestors as ordered; otherwise, carefully observe instructions included with your own arrestor.

If media other than carbon is to be used, contact a TIGG representative for any procedural changes.

2.0 SAFETY CONCERNS

WARNING: Wet drained activated carbon preferentially removes oxygen from air. In closed or partially closed containers, the oxygen concentration can reach dangerously low levels. Therefore, OSHA procedures related to entering low-oxygen spaces should be followed by workers who must enter a vessel containing wet carbon.

Activated carbon can react with oxidizing/easily oxidized substances such as ozone, concentrated oxygen, halogens, ketones etc. to liberate heat in addition to that which is normal for physical adsorption. Regular activated carbon is not recommended with these materials, **especially in intermittent use application.**

If it is used in these applications contact a TIGG representative to discuss the necessary precautions to prevent temperature excursions. **In this application, TIGG SAFE carbon should be used.**

3.0 UNLOADING & STARTUP PROCEDURES

3.1 Receiving

When a unit is delivered to the site, it should be checked thoroughly to ensure all required items have been received and the equipment is free of any shipping damage **prior to signing the bill of lading.**

3.2 Rigging

All equipment will arrive at the job site via truck. The adsorbers will usually be filled with carbon prior to shipment. The unit should be carefully removed from the

truck in a horizontal position by either a forklift or an overhead crane. If a crane is used it is advisable to use a properly sized spreader beam and lifting cables.

Following are weights of the NIXTOX units.

UNIT	Empty Wt.	Filled Wt.
Econosorb V	-	218
N50	-	150
N100	-	260
N150	-	390
N250	-	530
N20 XP	-	60
N50 XP	-	130
N100 XP	-	230
N400 XP	-	440
N750 PDB	850	1500
N1200 PDB	1200	2200
N1800 PDB	1425	2925
N2500 PDB	2860	4860
N4000 PDB	2735	5935
N5000 PDB	3115	7515
EVP-1000	550	1550
EVP-2000	600	2600
EV-1000	765	1765
EV-2000	1340	3340
EV-3000	1700	4700
EV-5000	3700	8700
RADIAL UNITS		
N-500	160	360
N-1000	220	620
N-1500	240	540
N-3000	600	2200

Once the adsorber has been removed from the truck, it should be placed on a stable, level surface and oriented to complement the piping and blower arrangement. After the adsorber has been correctly positioned, the piping or hose connections can be made.

The following units will have either male NPT fittings or FNPT couplings:
Econosorb V, N50-N250 & N20 XP-N100 XP, EVP-1000-2000

All of the PDB, Radial Flow and EV-1000-5000 units have duct connections.

The N400 XP unit has flanged connections.

The polyethylene units, with the exception of the N20 XP, have a stainless steel electrical grounding rod installed in order to prevent static electricity buildup. Connect to a ground.

3.3 Startup

3.3.1 Breakthrough Detector

Most of the units can be supplied with a "Breakthrough Detector". It will be shrink wrapped and located on the fork tubes. It should be installed on the ¾" connection on the top of the adsorber. Remove the tape covering the diffusion ports on each end.

Breakthrough detectors for the radial units use a special fitting supplied on the unit side or, for Accumulator Cabinets, to a side fitting on the cabinet which is connected by tubing to the adsorber fitting.

The colored granules will change from violet to a brown color when organics(s) reach the ports – signaling that about 70% of the carbon bed is exhausted for that compound. A sliding shield, to prevent light from prematurely changing the indicator color, is moved to view the granules.

3.3.2 Prewetting - (if required, see Sec. 1.0)

For upflow models, plug the bottom side gas inlet port and fill with water; let stand for 30 minutes and drain off excess water through the bottom condensate drain or the gas inlet.

The water remaining in the carbon acts as a heat sink to reduce the temperature rise. The water will reduce the saturation adsorption capacity, somewhat. In streams containing halogenated organics, the reduction can be significant and the breakthrough will be earlier than expected with a dry bed.

NOTE: The adsorbent may require rewetting, or the incoming gas may be humidified as an option, if the gas to be treated is low in humidity.

3.3.3 Initiating air/gas flow

When all the piping/duct connections have been made, the Breakthrough Detector has been installed (if provided), and any prewetting (if required) has been completed and the blower/fan has been commissioned, the unit is ready to accept the flow of gas/air.

A momentary emission of adsorbent fines created during shipment may be noted at high flows. If the possibility of a small quantity of dust is objectionable, a cloth bag tied to a fitting may initially filter outlet air, or the unit could be purged at another location prior to installation.

4.0 MISCELLANEOUS

4.1 Condensate Drains

All NIXTOX and ECONOSORB V units have drains thereby eliminating the need for siphons or disconnecting air sources for draining. The upflow units may be drained full time via a customer applied liquid trap with sufficient head to exceed the airflow back pressure and thus avoid leakage of untreated air.

Bottom edge drains on the radial units may remain open, since air reaching them already has been treated. Accumulator cabinets also have drains, which can be connected to radial unit drains, as desired.

4.2 Accumulator Cabinets for Radial Units

Accumulator cabinets, supplied by TIGG, are recommended for unsheltered installations and where the treated air must be analyzed. Also they are ideal if the air is to be recycled, require further treatment or must be directed to a stack.

With the radial unit placed inside the cabinet, the internal flex hose (supplied) is connected to the adsorber inlet, and the air source is connected to the external duct connected to the flex hose.

4.3 Care Package (except for Econosorb V)

A package including a 2" rain cap, 2" close nipple, 2-2" Reike bungs, sticky wicket and installation instructions are generally shrink-wrapped to the bottom sides of the N50 - N250 units. For installation in unsheltered areas, install the rain cap on N50 – N150 drums with the top depression. The N250 is supplied with a 4" rain shield. Use the pipe nipple (N50 – N150) to eliminate overflow into the unit, and install the sticky wicket on the N50 – N250's to prevent water from entering the adsorber.

4.4 Accessory Fans and Motors

Fans are available and can usually be premounted with the adsorber onto a skid.

5.0 REFILLING ADSORBERS WITH CARBON

Depending on the type of unit the following steps should be taken:

- Remove the unit cover or handhole/manway.
- Pour or vacuum the spent adsorbent out and discard in an approved manner.
- Pour fresh adsorbent directly into upflow units. Level the top of the bed.
- Radial units should be filled slowly and evenly in the annular space between the distributor and side until the bed is within one-two inches of the top, avoid pouring adsorbent inside the distributor column.
- Level the top of the bed.
- Replace the top or close the adsorber fittings and return to operation.

Note: N50, N100 and N250 may have been specially ordered in closed head versions, and are not normally refilled.

CAUTION: Depending on the application, spent adsorbent may be capable of evolving toxic or combustible levels of vapor which may require special handling procedures.

6.0 TROUBLESHOOTING

This section is intended to identify some of the more common problems which may be encountered during the operation of a vapor phase carbon system. The following discussion is not intended to be all-inclusive since situations and circumstances will vary with each individual system by virtue of design, operating philosophy etc. Therefore, this section should only be considered as a guideline for troubleshooting. If the problem is not solved, please call a TIGG representative.

6.1 General

The problems which arise generally fall under the following categories:

- High pressure drop
- Poor adsorption and inefficient carbon usage

6.2 High Pressure Drop Adsorbers w/Plenum

High pressure drop can usually be caused by:

- Excessive moisture accumulation in the plenum and/or
- Blinding of the plenum by particulates

6.2.1 Excessive Moisture Accumulation

If excessive moisture is present in the process vapors, liquid may accumulate within the bottom portion of the unit. Excessive moisture accumulation may restrict or completely block portions of the inlet duct connection and the open space beneath the carbon support.

Either restriction or blockage will increase inlet velocities and pressure drop through the unit. This condition may be

avoided by periodically draining the inlet lines and drains on the unit.

6.2.2 Blinding the Plenum

The plenum is constructed of black porous polyethylene support medium (N250 N400 XP, EV-1000 – 5000) or stainless steel (N750 PDB-N5000 PDB) attached to angle bracing every 18 inches. The porous polyethylene looks like pelleted carbon bonded together. The porous polyethylene and stainless steel plate not only supports the carbon, it also provides uniform distribution of the vapor.

If the influent vapor contains an excessive amount of particulates, the particulates may build up on the underside of the porous plate, causing a restriction of the open area, channeling and an increase in the pressure drop. If excessive blinding occurs within the unit, an upstream filter may have to be installed to remove the particulates prior to the adsorption unit.

6.2.3 Poor Adsorption and Inefficient Carbon Usage

Poor adsorption, and/or inefficient carbon usage, may be caused by the following:

- Channeling – Level the bed
- Carbon saturation – Change the carbon
- Premature increase in the effluent concentration – check the influent concentration
- Change in types of contaminants in the influent – Compare influent analyses with original
- Presence of non-adsorbable organics in effluent – Compare influent analyses with original

For reorders, replacement adsorbents or further technical information please contact TIGG Corporation, 1-800-925-0011